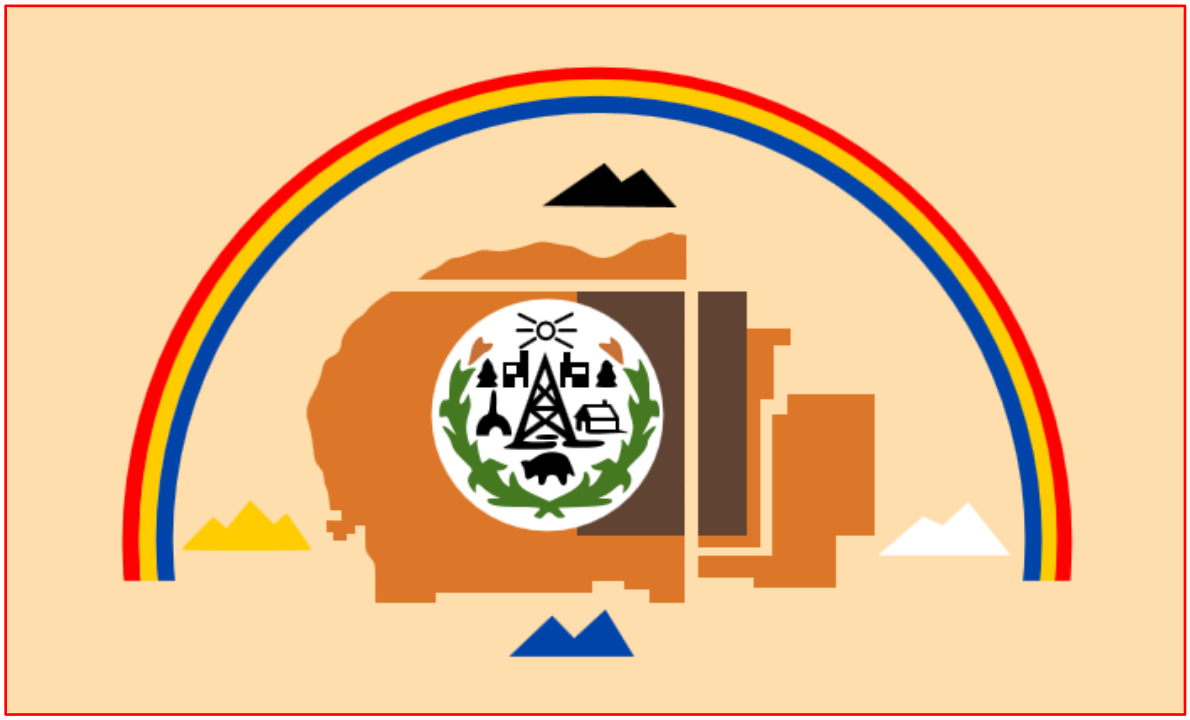
FORMER BENNETT FREEZE AREA

INTEGRATED RESOURCE MANAGEMENT PLAN



Prepared For:
Bureau of Indian Affairs, Navajo Region
And
The Navajo Nation

Prepared by:
ECOSYSTEM MANAGEMENT, INC.
3737 Princeton Dr. NE Suite 150
Albuquerque, NM 87107
(505) 884-8300

TABLE OF CONTENTS

List of Tables

List of Figures

1. Executive Summary

This document is the Integrated Resource Management Plan (IRMP) for the Navajo Nation chapters affected by the Bennett Freeze on the Navajo Nation. This IRMP was developed by Ecosystem Management Inc. with assistance from an interdisciplinary Task Force and Core Teams comprised of representatives with Bureau of Indian Affairs (BIA) and Navajo Nation. Additionally, in the planning process opportunities for cooperation between Departments were recognized and coordinated. This IRMP is the result of this cooperation.

This IRMP is a strategic, vision-based, long-range management plan based on Navajo Nation members' interests, needs, and concerns for their lands, natural and cultural resources. The IRMP for the FBFA will serve as a Navajo Nation policy document, based on the Navajo Nation's vision for the redevelopment of the FBFA and its resources and serves as a strategic level plan for the integrated management of Navajo Nation resources in the FBFA. This IRMP provides guidelines for strategic resource management in order to restore, preserve and manage these resources for future generations.

The IRMP is intended to be a management guide for Navajo Nation Department directors and resource managers associated with the FBFA and affected people. It translates the vision into goals and lays down objectives for present and future resource management. This document will be used as a framework to assist the Navajo Nation Council and Administration in decision-making, and will guide development and implementation of individual Resource Management Plans within the FBFA and development. Integrating all resources under one plan helps to identify and resolve existing and potential conflicts between resource management activities.

The IRMP has been prepared under guidelines provided by the Bureau of Indian Affairs (BIA) Office of Trust Responsibilities. It meets the requirements of the National Environmental Policy Act (NEPA, 42 U.S.C. §4321). It also serves to satisfy Navajo Nation regulations and conforms to all pertinent federal statutes.

Over the past year, the IRMP Task Force discussed four Alternatives for development in the FBFA that were developed by the BIA and are reflective of the needs described in the 2008 FBFA Recovery Plan (WHP 2008a). The Preferred Alternative was selected based on the needs identified in the 2008 Recovery Plan.

The Alternatives are listed below:

1) **No Action Alternative**— Continuance of current management practices without the increased levels in planning, coordination, and integration identified during the IRMP development process. It assumes the same level of planning and coordination, rather than the increased levels reflected in the Balanced Growth Emphasis, Growth and Economic Emphasis, and Restoration Emphasis Alternatives.

2) **Balanced Growth Emphasis Alternative (IRMP Preferred Alternative)** — This alternative supports environmentally and culturally responsible growth and economic development. Continued growth and development is expected but with implementation of the Balanced Growth Alternative. Development on Chapter lands associated with the FBFA will be encouraged to be compatible with the IRMP. This alternative focuses on balancing growth and economic development with minimal impact on environmental and cultural resources.
3) **Growth and Economic Emphasis Alternative** — This alternative focuses on continued growth and economic development while minimizing costs to Chapter programs. This Alternative imposes limitations on preservation of environmental and cultural resources and allows decisions to be driven by economics more than ecology or culture.
4) **Restoration Emphasis Alternative** — This alternative supports the development of a more active program to conserve resources on Chapter lands contained within the boundary of the FBFA. This alternative includes the greatest level of environmental and cultural protection. However, the Chapters will discourage economic growth in the FBFA unless it is consistent with preservation of biodiversity and cultural heritage. This alternative promotes preservation of environmental and cultural resources.

Chapter 1: Introduction

1.1 Background

The Former Bennett Freeze Area (FBFA) has a long and contentious history dating before the creation, by executive order, of the Moenkopi Hopi Reservation contained within the boundaries of the already established Navajo Nation in northeastern Arizona by President C. A. Arthur in 1882 (Wilkins 2002). Since the establishment of this land designation by President Arthur, a deep-seated dispute between Navajo and Hopi land use and ownership has remained. Over the years, various unsuccessful attempts were made to clarify the land use rights and ownership between the tribes. The conflicts over land use between the tribes eventually led to an administrative order, by the Commissioner of Indian Affairs, Robert Bennett, in 1966 freezing all development and construction within disputed areas. This administrative order became known as the "Bennett Freeze" and prevented any new development in the area and prohibited maintenance of existing structures on disputed lands. For forty years, this freeze on disputed lands remained in effect until 2009 when it was formally repealed by the 111th Congress.

There are nine Chapters of the Navajo Nation that have been impacted by the 40 year freeze. The long-term effect of the freeze within the FBFA has contributed to poor living conditions for many of those residents who chose to remain in the area. For many, life in the FBFA meant life without electricity, plumbing, or access to clean drinking water. One-third of residents living in the freeze area have to drive as many as twenty-four miles several times a week to haul potable water (WHP 2008a, pg. 34). Many other residents resort to drinking the same water as their livestock from nearby windmills (WHP 2008a, pg. 34). In addition to restricted access to potable water, many of the residents in the FBFA have little to no access to emergency medical treatment (three closest hospitals are located in Tuba City, Flagstaff, and Page AZ), protection from fire, access to close retail, commercial, or social services (WHP 2008a, pg. 34).

1.2 Purpose and Need for Action

Since the congressional repeal of the Bennett Freeze in 2009, the Navajo Nation believes that preserving the environment on its lands can be successfully balanced with the need for housing and infrastructure development, economic development projects, and other land uses developments. A comprehensive Integrated Resource Management Plan (IRMP) is essential to the planning process and for balancing environmental protection and development on the FBFA.

The purpose of this IRMP is to provide a guide for decision making by the Navajo Nation to manage existing Navajo Nation resources and to plan for integrated development. This IRMP accomplishes this by showing what the FBFA community's priorities are regarding resources and the type of development that is feasible. It provides information for the Navajo Nation to make informed and strategic decisions on how to manage and develop resources in the FBFA in an integrated, conservative, and protective manner. The IRMP for the FBFA is a values-driven resource management tool based on public input and should increase administrative efficiency, governmental transparency to Navajo Nation members and the general public, and will serve as a

consistent management tool for managing Navajo Nation resources through funding and staff transitions.

The need for the FBFA IRMP is to fulfill a number of benefits including greater interdisciplinary coordination when tackling management issues important to the Dine', increased administrative efficiency i.e., reduced duplication of effort and fewer contradictory directives to staff, greater governmental transparency to Tribal members and the general public, more consistent management of resources through funding and staff transitions, values-driven resource management based on public input, enhanced resource sustainability resulting from a vision-driven planning effort, more focused management on priority management issues, enhanced third-party funding based on clear statements of Navajo Nation priorities, and improved communications with regional partners eager for clear statements of Tribal priorities.

Because of the need for development as described, this IRMP will focus on the natural and cultural resources that are important in meeting the development goals of the Navajo Nation. The IRMP also pays attention to the need for balance with regard to protection, conservation, health and well-being, and the future growth of the FBFA.

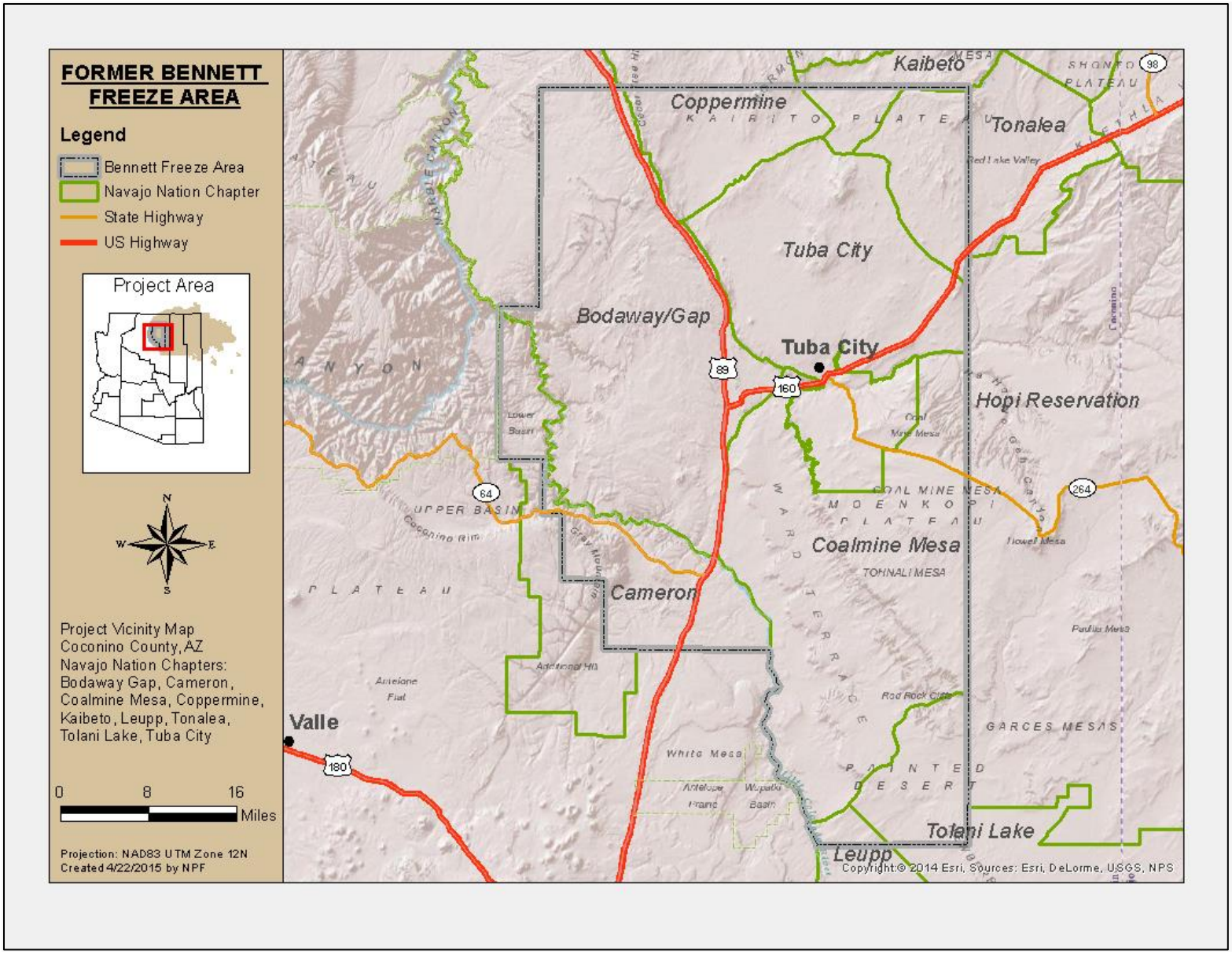


Figure 1: Former Bennett Freeze Area Project Area Map.

1.3 Former Bennett Freeze Area History and Land Acquisition

In 1934, the federal government sought to add about 234,000 acres to the Western Agency of the Navajo Reservation (the Navajo Reservation was created in 1868). The 1934 action proved to be contentious, as the Hopi Tribe claimed ownership of the land in question, citing that it was part of 2.5 million acres of land set aside for the Hopi people in an 1882 executive order signed by President Chester A. Arthur.

Over three decades passed without resolution of the land-ownership dispute. In 1966, the commissioner of Indian Affairs, Robert Bennett, halted development on 1.6 million acres of Navajo Nation land in northeastern Arizona that was claimed by both the Navajo Nation and the Hopi tribe. Bennett imposed the ban to stop either tribe from taking advantage of the other while they negotiated ownership. The ban became known as the Bennett Freeze. Nothing could be developed in this area; no new homes, new businesses or structural maintenance could occur. No roads or schools were built, and no installation of electric, gas, or water lines was permitted. While there were was a ban on new development and any maintenance to existing structures, there were two exceptions to the ban. One exception allowed for the placement/development of water wells, which were to be approved by both Tribes. The second exception was the inclusion of administrative safe-zones where development could occur. Administrative safe zones were located in Tuba City, Arizona and Moenkopi.

The dispute lasted for 40 years and paralyzed the residents in a state of poverty likened to a third world country. Few Hopis lived in the Bennett Freeze area, so the ban affected the Dine' especially hard. Many homes and ranches were deserted after falling into states of disrepair. The tribes settled their differences in 2006, and most of the land went to the Navajo Nation. In May 2009, President Obama cleared the way for federal funding to help rehabilitate the area.

The Navajo Nation has elected to develop its FBFA IRMP in partnership with the U.S. Department of Interior Bureau of Indian Affairs (BIA) and consistent with the National Environmental Policy Act of 1970 (NEPA). The Tribe has also elected to separate the planning effort into two sequential tiers: visioning and implementation. The visioning tier will focus on evaluating a range of alternate resource management strategies, from intensive resource utilization to intensive resource protection, selecting one which best reflects the cultural values and priorities of the Dine'. The implementation tier will focus on evaluating a range of alternate methods of implementing the previously-chosen vision. These alternate methods may include the establishment of an internal administrative framework for assessing project impacts, developing standards and guidelines against which project proposals are evaluated, or a reallocation of existing resources towards priority issues.

1.4 Location and Setting

The FBFA encompasses over 1.6 million acres in the northeast corner of Arizona and forms the westernmost portion of the Navajo Nation (Figure 2). Nine Chapters are included within the FBFA boundary including: Bodaway-Gap, Cameron, Coalmine Canyon, Coppermine, Kaibeto,

Leupp, Tolani Lake, Tonalea, and Tuba City. Two US highways (US 89 and US 160) and two state highways (AZ 64 and AZ 264) traverse through the FBFA. The FBFA is bordered by the Kaibeto Plateau to the north, the Colorado River and Coconino Plateau to the west, the Painted Desert to the south, and the Moenkopi Plateau to the east. The Little Colorado River traverses through the FBFA starting in the south and meandering west and eventually meeting up with the Colorado River at the confluence along the western border of the FBFA.

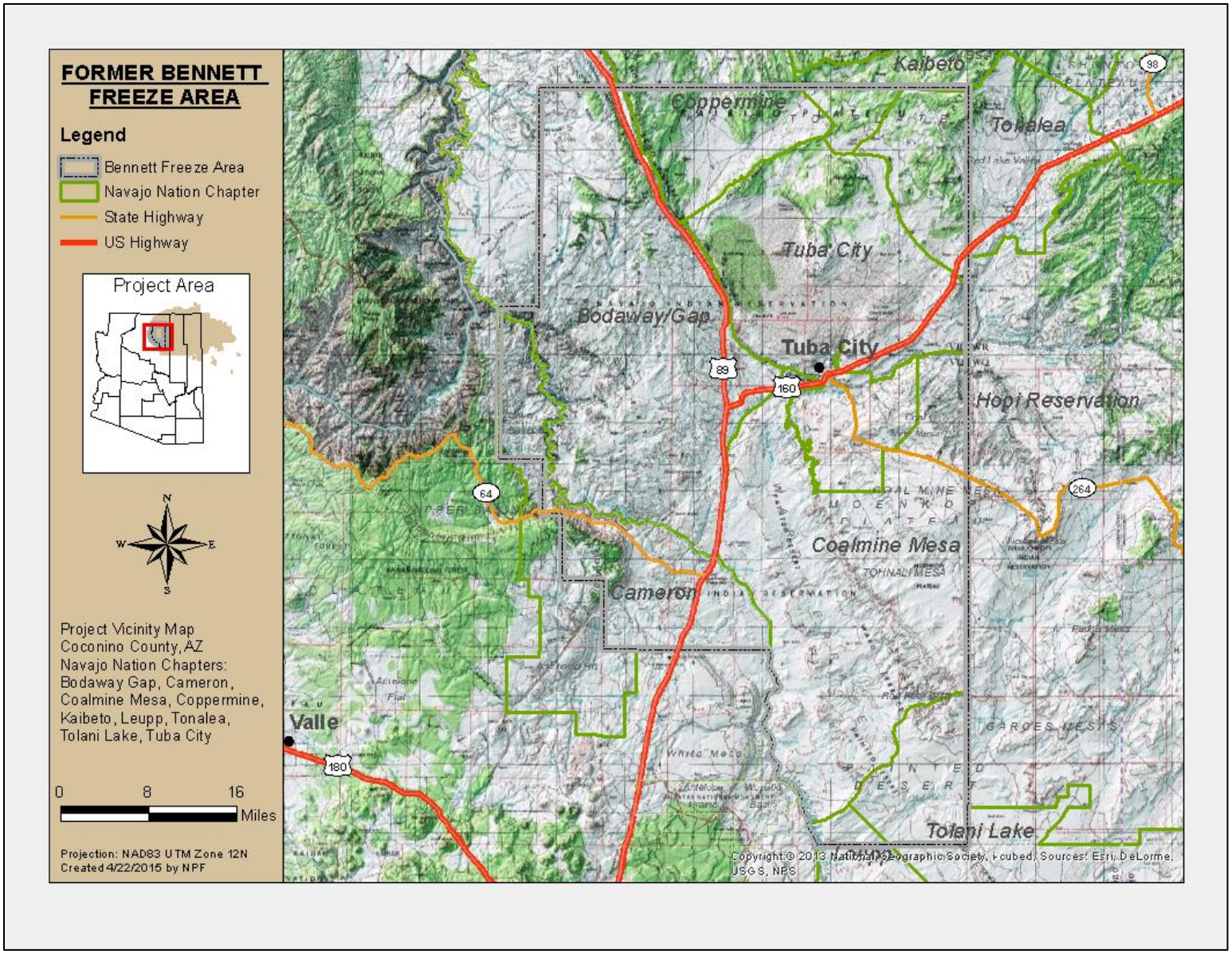


Figure 2: Topographic Map of the Former Bennett Freeze Area.

1.5 Planning Process

In 2012, the BIA-Navajo Region received federal funding to support the development of an IRMP for the FBFA that updates the 2008 Recovery Plan (WHP 2008a). The BIA has served as the federal lead agency in consultation with the Navajo Nation in the development of this IRMP. The purpose of the federal funding for the IRMP and the role of the BIA in this process was to ensure that the 2008 Recovery Plan was updated through a National Environmental Policy Act (NEPA) compliant process and to pave the way for the implementation of capital projects consistent with the goals outlined by the FBFA community. The early planning process involved discussions within the Navajo Nation in which Navajo Nation managers and members identified their expectations, concerns, and recommendations for the planning effort. In this process it was decided that the IRMP would function as an update to the WHPacific 2008 FBFA Recovery Plan. The BIA worked with the Navajo Nation to develop the planning efforts for the IRMP and the Environmental Impact Statement (EIS) NEPA documentation that will follow this IRMP. In the planning process, an important Memorandum of Understanding (MOU, Appendix A) between the Navajo Nation and the BIA was created for the sole purpose of developing this IRMP and the EIS. The MOU established the interdisciplinary team which is comprised of both Navajo Nation and BIA personnel. In addition to defining the team for the IRMP, the MOU also identified the resources to be evaluated, the team members from both the BIA and Navajo Nation, and defined the roles and responsibilities of the members identified in the MOU. The MOU was finalized and signed on 21 November 2015. The MOU-defined IRMP core team and interdisciplinary team were created with the joint goal to base this IRMP on the needs and desires of the Navajo Nation community and specifically those in the FBFA.

1.6 Public Involvement

1.6.1 Community Input Received during the IRMP process

The IRMP is a strategic, vision-based, long-range management plan based on community members' interests, needs, and concerns for their lands, and natural and cultural resources. This IRMP identifies resources that are important to the Navajo Nation and provides direction for how the Navajo Nation will need to manage lands in order to restore, preserve, and protect these resources for future generations. This plan spells out a vision for resource planning and management by the Navajo Nation.

The IRMP core team was created jointly by the Bureau of Indian Affairs (BIA) and the Navajo Nation. During the creation of this IRMP, the core team and interdisciplinary team members have changed; however, the primary roles and goals of both teams have remained consistent throughout the IRMP process. The Core Team and Interdisciplinary Teams helped staff to understand:

a. Resources on FBFA lands that are utilized by the Navajo Nation community.
b. Natural Resource and environmental problems and concerns.

The development of the IRMP was an open and inclusive process. In addition to the teams, input from community members was achieved through:

- Inclusion of each Chapter's Community Land Use Plans
- Overview of IRMP with Chapter members on 13 November 2014, Tuba City Chapter, Tuba City Arizona
- Coalmine Canyon Chapter House Meeting 9 March 2016, Coalmine Canyon, Arizona
- Workshop on 16 March 2016 in Tuba City to inform Chapter members on the IRMP and the IRMP process, Tuba City, Arizona.

1.7 Issues and Concerns

Several critical issues have been identified by the BIA and Core Team members within the FBFA including water rights, recovery from the halted development within the FBFA, and the restriction on development within Navajo Nation cultural and religious areas.

1.7.1 Water Rights

The Navajo Nation has severe water infrastructure deficiencies that impact the health, economy, and welfare of the Navajo people. The lack of adequate domestic and municipal water is the greatest water resource problem facing the Navajo Nation. Given the limited Navajo Nation resources, and the limited federal budgets and authorizations, the water resource problems will become increasingly acute, intensifying the poor socioeconomic conditions on the Navajo reservation. Critical water rights within the FBFA include the Colorado River and the Little Colorado River. The Western Water Policy Review Commission (Pontius, 1997, NNDWR 2011) reports that the average annual flow of the Colorado River at Lee's Ferry is between 13 and 15 million acre-feet. The Navajo Nation water rights in the mainstream of the Colorado River remain unquantified. For the Navajo Nation, access to mainstream water is limited by legal, physiographic, and environmental factors (WHP 2008a, pg. 33). These limitations may complicate the ability of the Navajo Nation to fully exercise its water rights even though the date of establishment for the reservation precedes most other users (WHP 2008a, pg. 33).

The median annual flow of the Little Colorado River at the border of the Navajo reservation is approximately 162,900 acre-feet (BOR 2006, NNDWR 2011) and the median depleted flow is 222,450 acre-feet (NNDWR 2011). The variable flow regime and the high sediment load of the Little Colorado River create challenges to water development in the region.

The costs associated with pumping and pipeline development have the potential to limit the use of Colorado River water for the Navajo Nation including communities impacted by the FBFA (NN DWR 2011). Another limiting factor is the federally mandated protection of endangered species including fish species such as the humpback chub (*Gila cypha*), razorback sucker (*Xyrauchen texanus*), Colorado pikeminnow (*Ptychocheilus lucius*; formally known as the Colorado squawfish), and bonytail chub (*Gila elegans*) (NNDWR 2011). Laws and regulations

protecting these species may create significant barriers for future water access projects in the FBFA, especially the chapters close to the Little Colorado River.

1.7.2 Recovery from Restricted Development within the FBFA

Housing, transportation, utilities, and business have all been impacted by the ban on development within the FBFA. The recovery from this ban is of concern in the IRMP development.

A planning tool called the FBFA Recovery Plan was written by WHPacific in 2008 in an effort to help Chapters and the Navajo Nation make decisions about potential capital projects. The document defined potential projects from which to choose in areas such as buildings, equipment, road repair and roadway system development, parks, and facilities. The WHPacific Recovery Plan outlines many capital improvement projects for the nine chapters within the FBFA. Capital projects are defined as a long-lasting item that can be purchased for more than $5,000, including planning and design services, construction and repair, and costs associated with the land withdrawal process (WHP 2008a, pg. 63). The capital improvement projects in which the nine chapters agreed on during the drafting of the Recovery Report (WHP 2008a) were health clinics, adult education facilities, shelters or group homes for domestic violence victims, community centers, and outdoor sports complexes. The total cost estimate to provide the amenities expected in a modern American community was $730 million, and included elder care facilities, fire and police stations, day care centers, chapter houses, schools and animal shelters.

Community Land Use Plans (CLUP) were also updated for the nine Chapters within the FBFA. Community Land Use Plans function as five-year strategic planning documents for each Chapter and are a requirement of the Navajo Nation indicated by the Local Governance Act requirements (Title 26, §2004, (c)(1)). These documents are written by a community-appointed committee and the documents outline the goals and objectives for development and the community's preference for regulating their chapter lands. The documents are to be updated every five years to document changes in land use, demographics, and community members' objectives and goals for their community.

1.7.3 Restriction on Development within Navajo Nation Religious Zones

Of critical concern when considering development within the FBFA is the protection of Navajo Nation cultural and religious areas. The signing of the Navajo-Hopi Intergovernmental Compact in November of 2006 resolved the 40-year-old dispute over the FBFA. The compact also recognized the spiritual heritage of both tribes and ensured that religious traditions can continue while ensuring the conservation of eagles under federal law. The compact allows Dine' to enter Hopi land without a permit for traditional religious practices. In turn, the Hopi are allowed to enter Navajo Nation land without a permit for religious practices.

Article 4.1 of the Navajo-Hopi Intergovernmental Compact states that no development will occur within any areas listed under Exhibit C of the Compact (Intergovernmental Compact 2006).

Exhibit C is a confidential list of eagle nests on Navajo Lands. Exhibit C may not be shown to members of the Navajo Nation and Hopi Tribe other than elected leaders and those employees of the Navajo Nation and Hopi Tribe having responsibility for performance and/or enforcement of the Compact (Intergovernmental Compact 2006). Additionally, the Compact states that the Navajo Nation must provide written notice to the Hopi reservation when any construction or development is considered within 800 meters of any of the areas listed within Exhibit C. The procedures for how development projects are reviewed for compliance with this compact are not specified in the agreement and it is assumed that the Navajo Nation Heritage and Historic Preservation Department would have jurisdiction and follow their own procedures for development (WHPa 2008).

1.8 Vision, Goals and Objectives

1.8.1 Vision Statement

The Navajo Nation is committed to restoring harmony and a sustainable environment among all living things. The management, conservation, improvement, and sustainability of the social and natural resources of the FBFA are the goals of this IRMP. The objective of this IRMP is to create a planning tool that presents the affected FBFA social and environmental resources and conditions, spotlights the affected Nation-identified needs, and summarizes the Nation-identified actions and projects to restore harmony to the FBFA while encouraging sustainability.

1.8.2 Goals and Objectives

The goal of this IRMP is to aid in the planning and facilitation of the FBFA recovery process. This document functions as a planning tool to aid in the recovery from a 40-year long development freeze. The freeze has had a lasting impact for all chapters and neighboring chapters in the FBFA. Each community affected by the freeze has their own goals and objectives for their communities; however, the following are a list of goals for recovery voiced by the majority of the community members in the FBFA based on the Recovery Plan (WHP 2008a) and Community Land Use Plans developed during the 2008 Recovery Plan, and conversations with community members held during the IRMP development process:

- Quality housing with dependable power and reliable potable water in both developed (urban centers) and rural areas within the FBFA.
- The ability to foster safe communities with strong growth potential in the direction that each community sees fit.
- Ability to provide gainful employment opportunities within the community for community members.
- Provide lifelong educational opportunities to community members.
- Economic opportunity that fosters education, training and provides jobs which support community desire to be self-sustaining and independent.
- Easy access to health, medical, and social services.

- Respect and honor for traditional values such as livestock grazing and agriculture while balancing the needs for growth and development within the community.
- Protection of natural and cultural resources, historic properties, sacred sites, and sacred species.

Chapter 2: Resource Assessment

The purpose of this chapter is to describe the existing or affected environment, goals and objectives for natural and cultural resources and economic development. The focus of the description is the lands and waters of the nine Navajo Nation Chapters within the FBFA.

2.1 Resource Descriptions

2.1.1 Cultural

Cultural resources are historic and archaeological sites and Traditional Cultural Properties (TCPs). Historic and archaeological properties include, but are not limited to, artifact scatters, structures or structural remains of various types with associated features, rock art and inscriptions, ceremonial/religious features, and roads and trails. A TCP is a property that has associations with the cultural practices, traditions, beliefs, lifeways, arts, crafts, or social institutions of a living community.

Cultural resources and TCPs are only some of the features of the overall ethnographic landscape of the Diné People. While these discrete features are important, their overall value is only understood within the overarching cultural landscape of Navajoland, which includes not only cultural resources but geography, hydrological features, natural resources, wildlife, and livestock (National Park Service 1995). In other words, Diné sense of place is critical to the expression of Diné culture and interpretation of the archaeological record. This bond to place is timeless, guiding the Foundation of Diné Law (*Diné Bi Beehaz'áanii Bitse Siléí*). Examples of the cultural and ethnographic landscape include the San Francisco Peaks (*Dook'o'oosłííd*)—one of the six sacred mountains (*dził naat'ááh*) that define the ethnographic landscape—the Little Colorado River (*Bits'íís Nineez*), natural springs, rock piles, boulders, lighting struck trees, plant gather places, and game traps (Martin 2002). While these examples are distinct features within the ethnographic landscape, Navajoland is not discontinuous, but experienced through herding, hunting, farming, and travel amongst these definitive features throughout time immemorial.

The Navajo Nation Heritage and Historic Preservation Department (NNHHPD) ensures Navajo traditional concerns are addressed in undertakings as they pertain to project management, land-use planning, and cultural resource management. The NNHHPD maintains records of cultural resources investigations and cultural resources properties within lands administered by that office.

Due to the constraints imposed by the Bennett Freeze Act, limited infrastructure maintenance or new construction occurred in the area; consequently, few cultural resource inventories were conducted there for over 50 years and documentation is limited. NNHHPD has been tasked with compiling information about known cultural resources in the FBFA.

Anticipated archaeological or historic sites in the FBFA include:

- Agricultural sites: sites comprised of agricultural fields and/or agriculture-related features such as canals, rock piles, and rock alignments.

- Artifact scatters: sites composed entirely of artifacts and lacking associated features. Some artifact scatters may be comprised of a single material, such as a flaked stone or ceramics, whereas others encompass multiple artifact types.
- Habitation sites: habitation sites cover a range of site manifestations, from ephemeral Paleoindians campsites to the large villages to historic Navajo homesites.
- Resource procurement sites: resource procurement sites cover a range of site sub-types, all of which focused on the procurement of some type of resource, such as raw tool stone or plants.
- Rock art: pictographs or petroglyphs on rock faces and cave walls.

Anticipated TCP types in the FBFA include:

- Place for gathering plants
- Place for gathering contents of sacred bundles
- Place where ceremony has been held
- Former home site location
- Former sweathouse location
- Prayer offering place
- Place associated with general Navajo origin
- Place associated with origin or home of a clan
- Place identified as home of a Holy Being

2.1.2 Geology

The FBFA lies within the Colorado Plateau which is characterized by canyons, high altitude, steep escarpments, flat plateaus comprised of gently dipping sedimentary rocks, and an arid climate (Thornbury 1965). The most distinctive structural feature of the province is its large number of monoclines. The monoclines are broken throughout the province by structural basins and up warps of considerable relief. Volcanic structures are concentrated around the plateau's margin but are also scattered throughout its interior (Kelley 1955).

The character of the Colorado Plateau is a product of the interaction of three processes: uplift, volcanism, and erosion. Erosion is the primary force that has created the extant landscape. The tectonic event that uplifted the Colorado Plateau involved the westward movement of the North American plate, beginning about 75 million years ago. Over a period of the next 25 million years, the western portion of the North American plate broke, buckled, and experienced uplift, forming the Rocky Mountains. The following 45 million years were characterized by degradation as material was removed from the surface of the plateau to form the Middle and Late Tertiary deposits in other regions.

2.1.3 Water Resources

Water resources on the Navajo Nation include rivers, streams, washes, and wetlands. Figure 3 is a map that shows some of the water sources within the FBFA. Major surface water resources within the FBFA include the Colorado River and the Little Colorado River. All water resources

within the Navajo Nation are under the jurisdiction of the Navajo Nation Water Code and are subject to the water management practices of the Navajo Nation. The Navajo Nation has enacted the Navajo Nation Clean Water Act, Water Quality Standards, and the Discharge Elimination System to protect the quality of water resources on the reservation. The Navajo Water Code prohibits any development within a half-mile of a well or windmill.

There are five aquifers that provide water for wells and springs across the Navajo Reservation: the Coconino (C), Navajo (N), Morrison (M), Mesa Verde (V), and Dakota (D) aquifers. For the FBFA, the northern chapters are served by the N-aquifer and the southeastern chapters are served by the C-aquifer. These aquifers are composed of permeable sedimentary rock (mainly sandstone), and the quality of water within each aquifer varies greatly within their structures (WHP 2008a, pg. 133). In the deeper portions of the groundwater basins, water is typically too saline for consumption by humans or livestock. The highest quality water is found in the N-aquifer. The C-aquifer is estimated to store up to 413 million acre-feet of water and the N-aquifer stores approximately 290 million acre-feet of water (WHP 2008a, pg. 133). According to Navajo Nation Water Resources, groundwater storage in both aquifers greatly exceeds the annual demand, only a small fraction of the groundwater in storage can be readily developed.

Within the FBFA there are considerable water quality issues associated with abandoned uranium mines located in the Bodaway-Gap, Cameron, Coalmine Canyon, and Tuba City Chapters. Water quality issues associated with abandoned mines puts the communities at health risk due to detectible levels of heavy metals and radiation (WHP 2008a, pg. 134). The human health risks associated with contaminated waters will add a level of complexity to community planning. Mitigation efforts will be necessary to address water quality issues to prevent further health risks to the communities impacted by water quality issues.

Throughout the FBFA there are many windmills which are typically used to water livestock and are productive in the FBFA. Many of these windmills are at risk; however, for bacterial contamination from contact with livestock as well as the potential for uranium contamination (WHP 2008a, pg. 134). Water quality testing of windmills is not required by the Navajo Nation and water quality of these windmills is uncertain. Uncertainty of water quality associated with windmills, especially for those located in remote areas, poses potential human health hazards due to the consumption of affected livestock and the frequent human consumption of water from remote windmills (WHP 2008a, pg. 134).

One of the most significant water resource problems on the Navajo Nation is the lack of adequate domestic and municipal water. Tied to this issue is a lack of water infrastructure, poor economic development, and a sustained level of poverty on the Navajo Nation (NNDWR 2011). Water resource problems are likely exacerbated within the FBFA due to the history of the area. The lack of domestic and municipal water forces communities, especially those within most areas of the FBFA, to depend on water hauling. Table 1 shows the total number of households affected by potable water resources. The total number of households without potable water was provided by

Indian Health Services (IHS). Addressing the deficiencies in potable water and water infrastructure are critical for successful recovery and development within the FBFA.

Table 1: Percent of FBFA Households without access to public water systems.

Chapter	Affected Households	Total Households*	Percent of Households
Tuba City	21	2,433	1%
Tonalea	25	651	4%
Bodaway	33	474	7%
Tolani Lake	26	202	13%
Cameron	67	326	21%
Coalmine Mesa	41	190	22%
Kaibeto	101	465	22%
Leupp	186	450	41%

*Total number of households data extracted from 2010 US census. IHS did not provide data for Coppermine.

Navajo Nation Water Resources has outlined three regional water supply projects in their draft 2011 strategy plan that will improve water supply in the FBFA, if implemented.

- Lake Powell to Peabody Pipeline which could provide the opportunity to convey water toward communities including Tonalea and Kaibeto.
- Western Navajo Pipeline project which could provide water to Cameron, Tuba City, Bodaway-Gap, and Coppermine FBFA communities.
- C-aquifer Leupp to Dilkon Pipeline Project which could provide water to Leupp and Tolani Lake FBFA communities.

This 2011 draft plan also includes plans for developing and rehabilitating local water supply infrastructure, as well as addressing small domestic and municipal systems not connected to a regional water supply project.

Water resources on the Navajo Nation and within the FBFA are vulnerable to the impacts of drought. Due to the arid climate of the region, drought has been and will continue to be of major concern to the Navajo people (NNDWR 2003). The impacts of drought will affect domestic water haulers, public drinking water systems, dryland and irrigator farmers, ranchers, recreation, wildlife, and forestry (NNDWR 2003). Drought is a common phenomenon on the Navajo Reservation and the occurrence of which is likely to increase due to changes in precipitation and heat patterns associated with climate change. Irrigation farming communities within the FBFA with access to the Little Colorado River alluvium, wells, or springs are considered by the Navajo Nation Department of Water Resources (NNDWR) to be of low to medium drought risk. Communities within the FBFA with storage reservoirs are considered by NNDWR to be of medium to high drought risk. Dry cycles can reduce surface water supply which can impact irrigation farms. Red Lake (Tonalea) irrigation project is located within the low to medium drought risk region of the FBFA. Irrigation projects and dryland farming communities within the Kerley Valley (Upper Moenkopi-Tuba City) region are considered to be of high drought risk

category. Access to water and the impacts of drought on existing water supplies should be considered in any development plans for the FBFA. Communities within the higher drought risk regions may require more strategic planning associated with development of water infrastructure and water access than communities in lower drought risk areas of the FBFA.

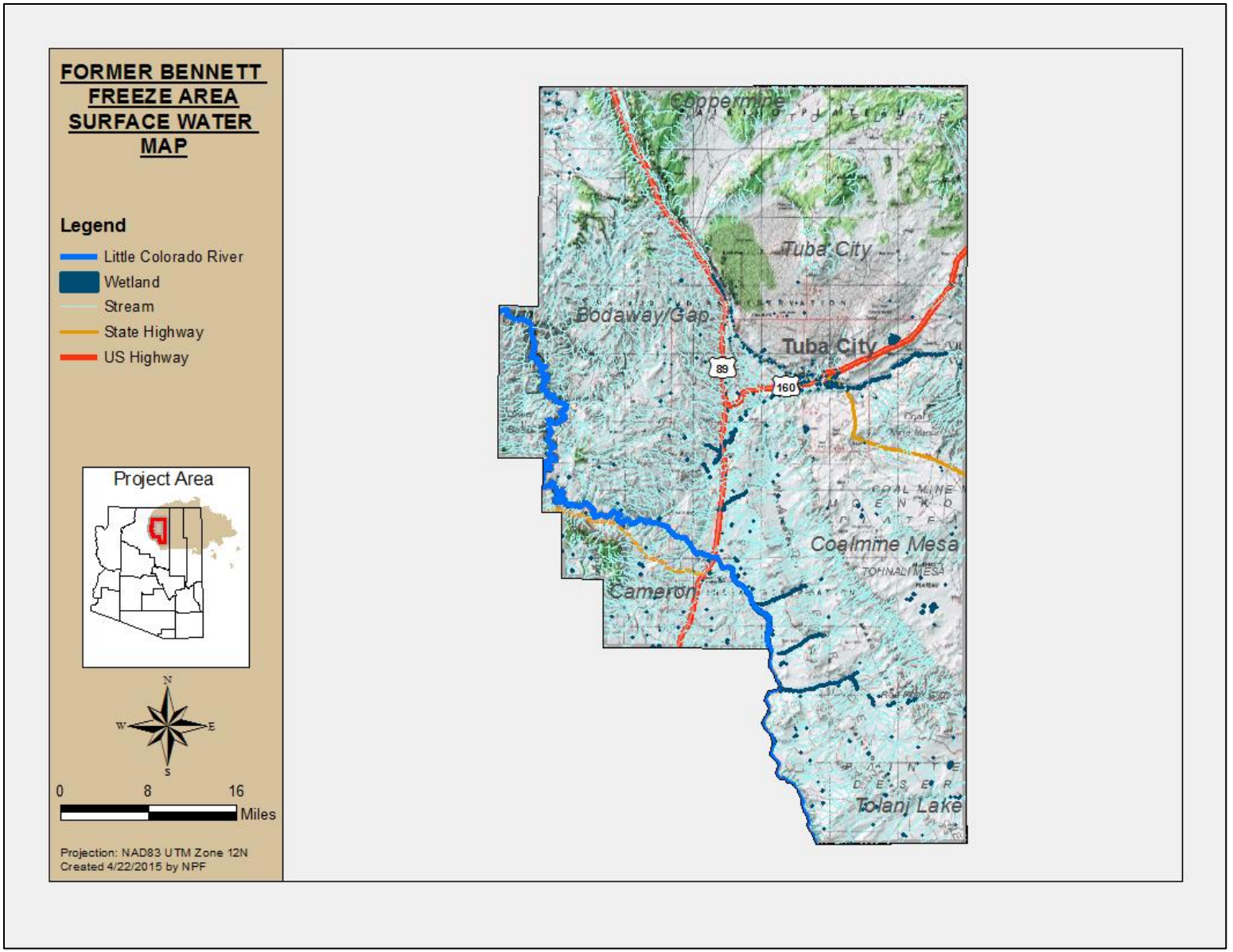


Figure 3: Surface Water Resources in the Former Bennett Freeze Area. This map depicts the surface water resources within the FBFA.

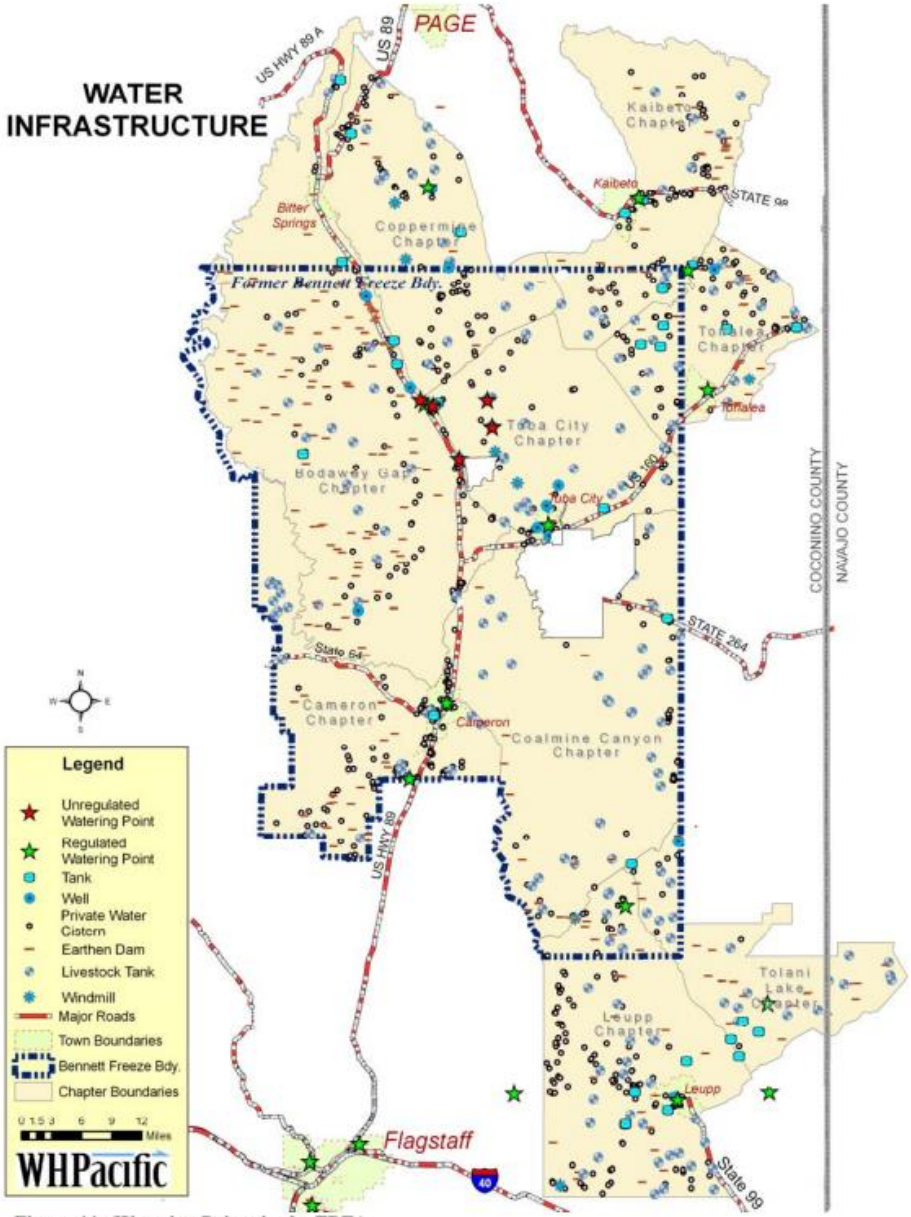


Figure 44: Watering Points in the FBFA

Figure 4: Water Infrastructure in the Former Bennett Freeze Area. Map from WHPacific FBFA Recovery Plan 2008 report.

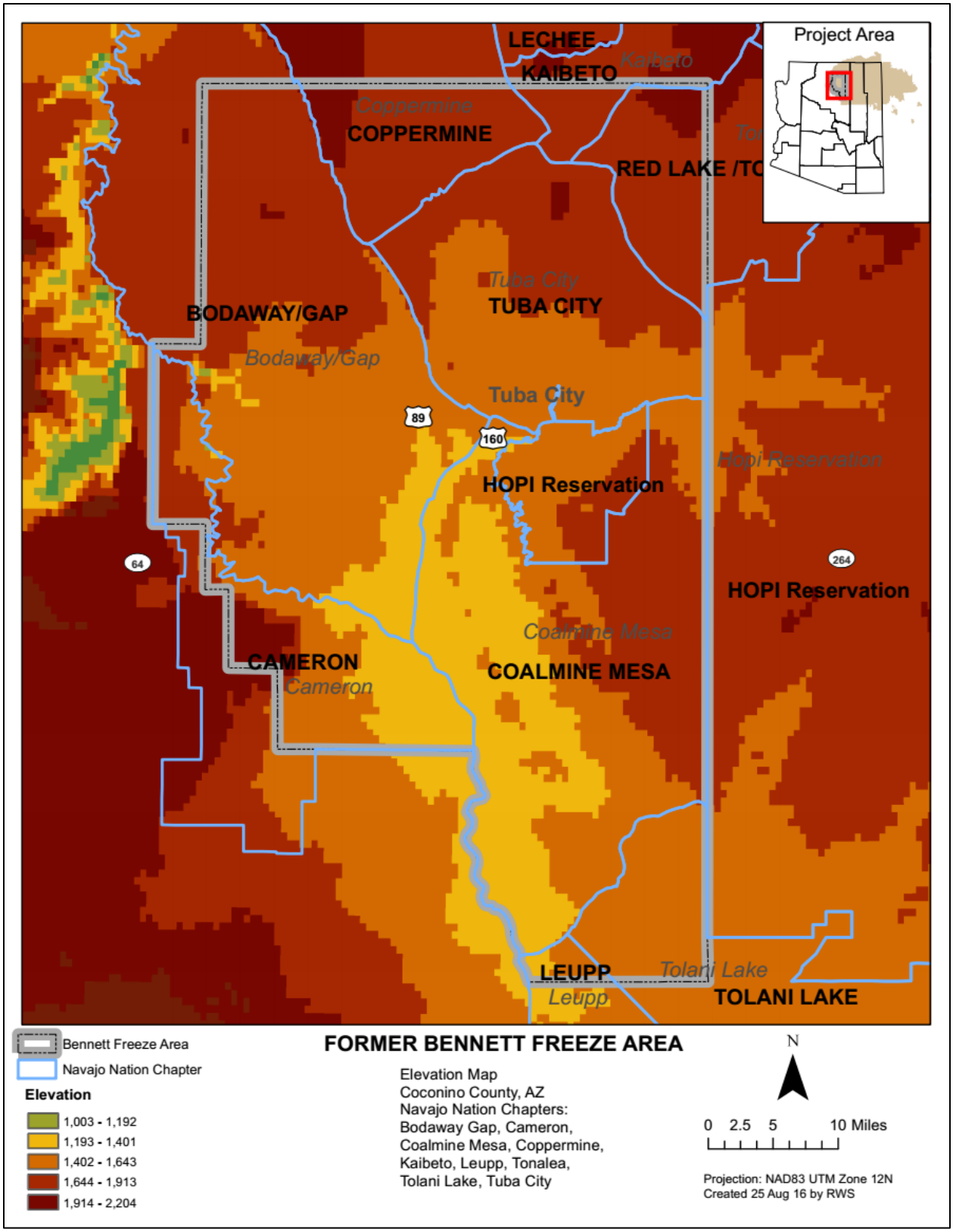


Figure 5: Elevation range of the FBFA on the Navajo Nation.

2.1.4 Dominant Soils

Soils on the FBFA support a variety of ecological sites (see Appendix B). The USDA National Resource Conservation Service (NRCS) Soil Survey delineated 13 soil associations occurring in the FBFA (Figure 6). Each soil unit identified has characteristics that can be used to determine the development potential of the region. While several soil unit maps have been created as part of the inventory, they are incomplete and the data is subject to revision. The soils that have been identified are as follows:

1) Deama-Tovar-Toqui association
2) Epikom-Tours-Purgatory association
3) Kinan-Pennell-Pagina association
4) Kopie-Quintana association
5) Palma-Mespun-Sazi association
6) Rock Outcrop-Lava Flows-Batterson association
7) Rock Outcrop-Moenkopie-Bluechief association
8) Rock Outcrop-Torriorthents association
9) Shedado-Begay-Anasazi association
10) Sheppard-Jocity-Jeddito association
11) Sheppard-Monue-Nakai association
12) Torriorthents-Badland-Rock Outcrop association
13) Winoa-Tusayan-Boysag association

2.1.4.1. Commercial Development Potential

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, and performance after construction and maintenance. Evaluating the potential for small commercial development in the FBFA based on soil type and soil properties reveals areas within the region that may have greater potential for commercial development than other regions. The USDA Natural Resources Conservation Service (NRCS) Soil Mapping Tool was used to evaluate the potential for small commercial development within the FBFA. Small commercial development refers to the construction of small structures that are less than three stories high and do not have basements. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification of the soil). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments (NRCS 2009). The rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. In Figure 7, areas highlighted in green are classified as “Not Limited” which indicates that the soil has features that are favorable for small commercial buildings. Yellow regions are classified as “Somewhat Limited” which indicates that the soils have features that are moderately favorable for small commercial buildings. Regions colored red are classified as “Very Limited” which indicates that the soil has one or more features that are unfavorable for small commercial building development. The soil limitations which determine these

classifications generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Within the FBFA the majority of the region is rated as very limited potential for small commercial development; however, there are some areas within the Bodaway/Gap, Coppermine, Kaibeto, Tonalea, Tuba City, and Coalmine Mesa Chapters which contain soils with features that would support small commercial building development (Figure 7).

2.1.4.2 Roadway Development Potential

Soil properties influence the development of roadways. Since roads are included in typical infrastructure supporting economic development, analysis of roadway potential is a crucial step in the planning process. Evaluating the potential for road development in the FBFA based on soil type and soil properties reveals areas within the region that may have greater potential for roads than other regions. The USDA Natural Resources Conservation Service (NRCS) Soil Mapping Tool was used to evaluate the potential for road development within the FBFA. Local roads and streets are defined as streets that have an all-weather surface and carry automobile and light truck traffic all year. These roads have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder (NRCS 2009). The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength, subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding (NRCS 2009). Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect road development. In Figure 8, areas highlighted in green are classified as “Not Limited” which indicates that the soil has features that are very favorable for road development. In green regions, good performance and very low maintenance can be expected (NRCS 2009). Yellow regions are classified as “Somewhat Limited” which indicates that the soil has features that are moderately favorable for road development. Limitations in these areas can be overcome or minimized by special planning, design, or installation. Within the yellow regions of the FBFA, fair performance and moderate maintenance of roads can be expected (NRCS 2009). Red regions within the FBFA shown in Figure 8 are classified as “Very Limited” which indicates that the soil has one or more features that are unfavorable for road development. The limitations in these areas typically cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected of roads developed in the red regions of the FBFA. Many of the Chapters within the FBFA have soils which are not suitable for traditional roadway (asphalt or concrete) development. The most restricted Chapters in terms of road development potential are Bodaway/Gap, Cameron, Coalmine Mesa, Tolani Lake, and Leupp.

An alternative to traditional road development is the development of road systems with a natural surface (not asphalt or concrete). Evaluating the potential for natural surface road development in

the FBFA based on soil type and soil properties reveals areas within the region that may have greater potential for natural surface roads than other regions. The USDA Natural Resources Conservation Service (NRCS) Soil Mapping Tool was used to evaluate the potential for natural surface road development within the FBFA. Natural surface roads and streets use the natural surface of the soil for roads. The ratings are based on slope, rock fragments on the surface, plasticity index, content of sand, depth to a water table, ponding, flooding, and the hazard of soil slippage (NRCS 2009). Figure 9 shows natural road development potential within the FBFA. Green regions are classified as "Well Suited" which indicates that the soil has features that are favorable for natural surface road development and has no limitations (NRCS 2009). Good performance can be expected of natural surface roads in these areas with little maintenance required. Yellow regions are classified as "Moderately Suited" which indicates that the soil has features that are moderately favorable for natural surface road development. This classification indicates that one or more soil properties are less than desirable, and fair performance can be expected. It is likely that natural surface roads in these regions will require some maintenance (USDA NRCS 2009). Red regions in Figure 9 indicate areas that have been classified as "Poorly Suited" which indicates that the soils have one or more properties that are unfavorable for natural surface road development. Typically, overcoming the unfavorable properties in these regions requires special design, extra maintenance, and costly alteration (NRCS 2009).

Comparing road development potential between the more traditional style road systems (Figure 8, asphalt or concrete) and natural surface road systems (Figure 9), there are far more areas within the FBFA that are suitable for natural surface road systems than there are for traditional road systems. Natural surface roads are likely challenging during monsoonal activity and spring thaw due to mud but are less costly than traditional style roadway systems. Within the FBFA, regions classified as having very limited potential for traditional road development (Figure 8) but do have more favorable ratings for natural surface road development (Figure 9) might benefit from advancements in soil technology and evaluate the potential for chemically treated (lithified) natural surface roads which offer the stability and durability of a more traditional style road system but might not be as restricted in terms of development similar to that of a natural surface road system. Hybrid roads have been tested in other areas of the Navajo Nation including Whiteclay Rd. Navajo Nation, AZ.

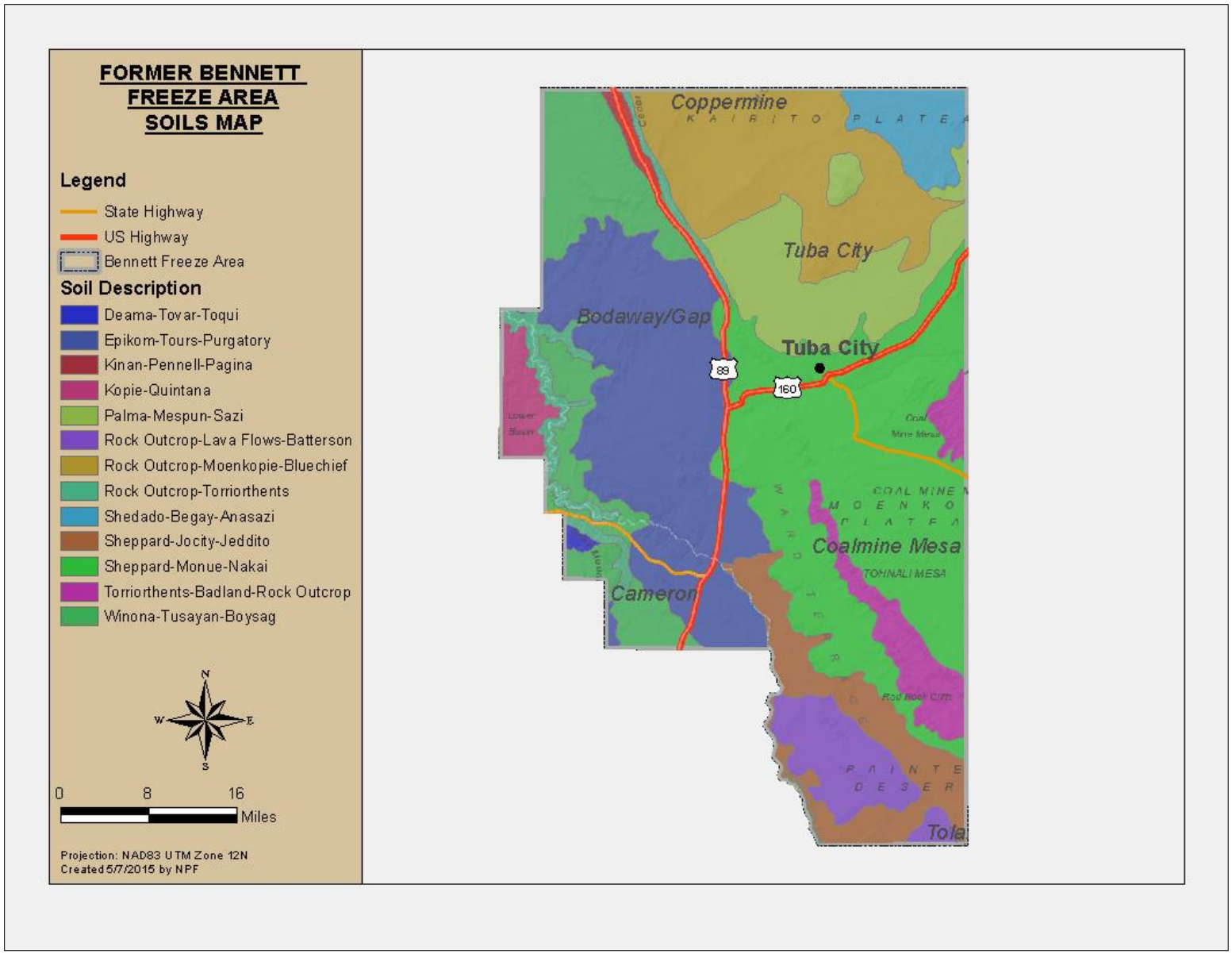


Figure 6: Soils associations delineated by the USDA NRCS Soil Survey within the Former Bennett Freeze Area.

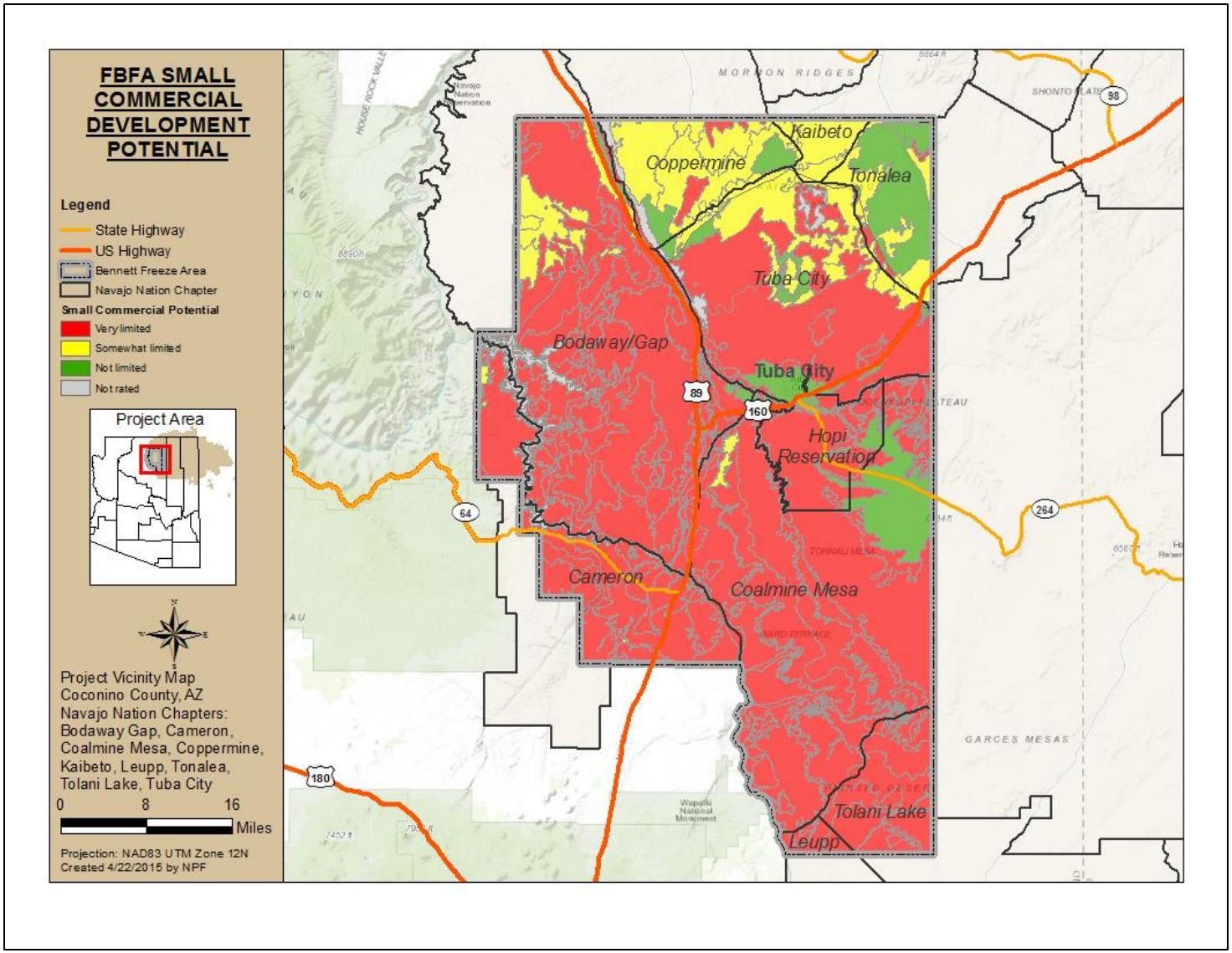


Figure 7: Small commercial development potential in the Former Bennett Freeze Area. Commerical development potential was determined using USDA NRCS soil mapping tools. Small commercial buildings are less than three stories high with no basement. Ratings are based on soil properties.

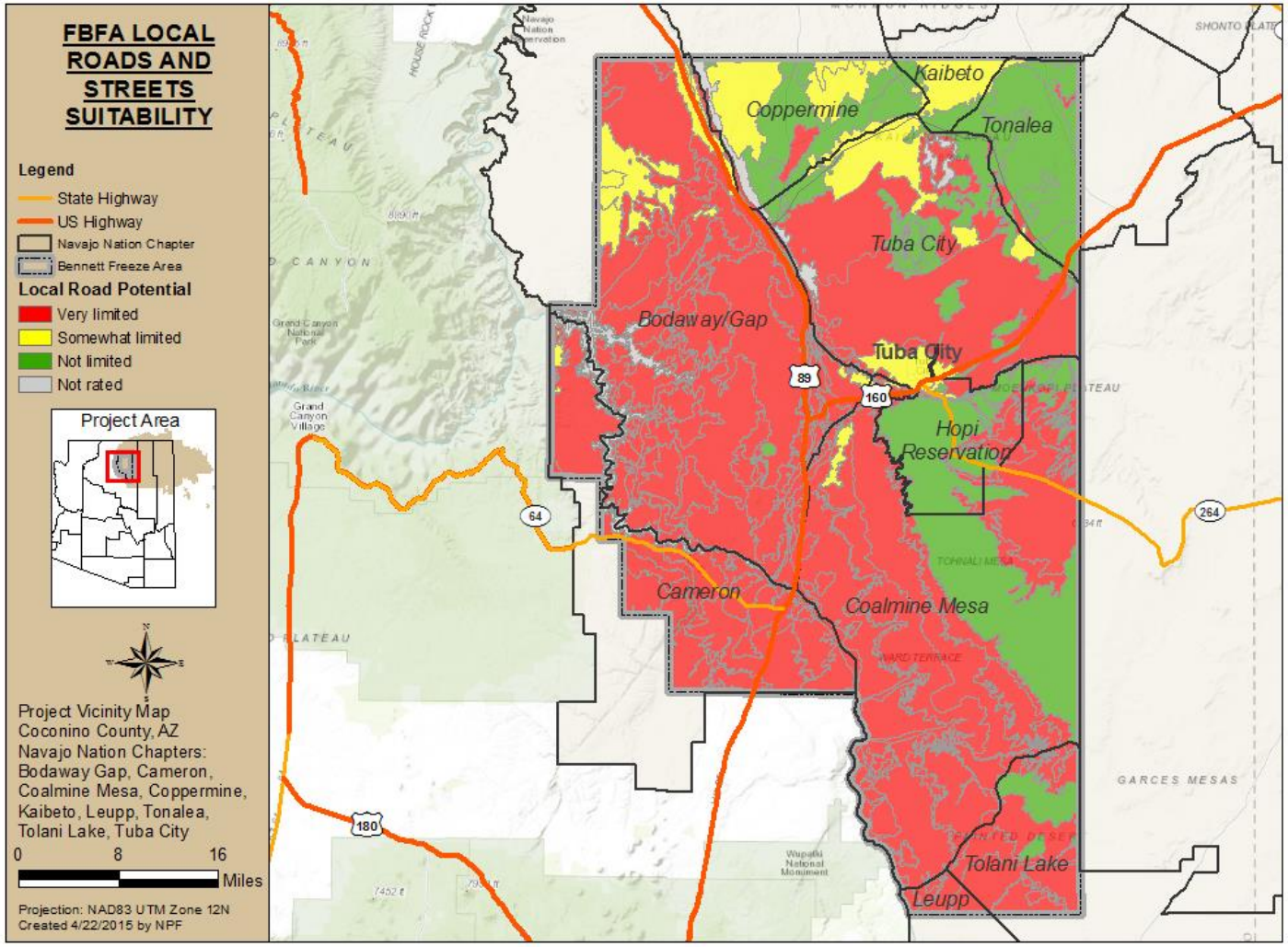


Figure 8: Local road development potential in the Former Bennett Freeze Area. Local road development potential was determined using USDA NRCS soil mapping tools. Ratings are based on soil properties.

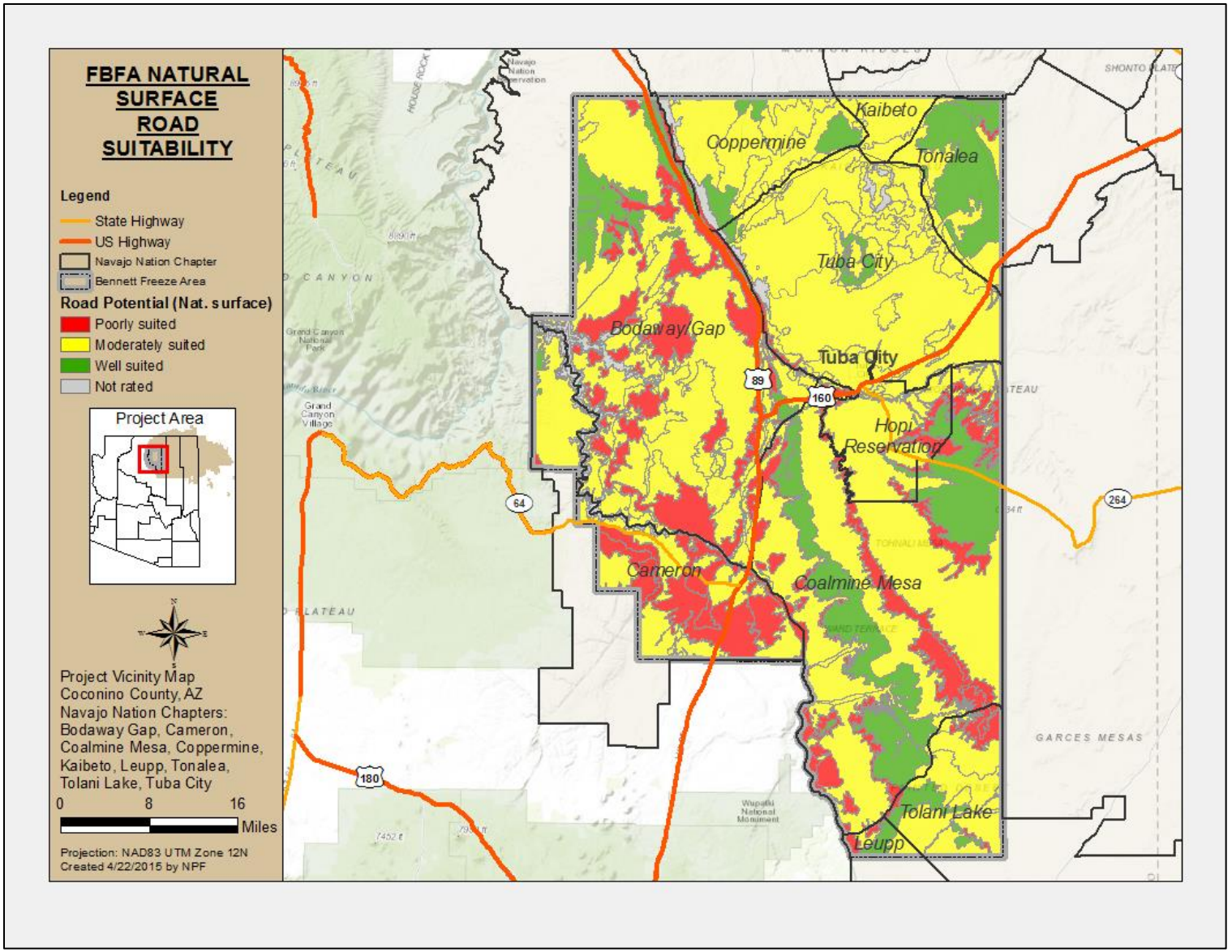


Figure 9: Natural road surface development potential in the Former Bennett Freeze Area. Natural road development potential was determined using USDA NRCS soil mapping tools. Ratings are based on soil properties.

2.1.5 Range Resources

Ranching and sheep herding are a major occupation and way of life for Navajo residents. A majority of the land on the Navajo Nation is used for grazing by residents (WHP 2008a, pg. 48). Currently, grazing is regulated by Navajo Grazing Regulations (CFR 25, part 167). The regulations work to preserve land and water resources on the Navajo Nation and rebuild deteriorating resources.

Overstocking and intense grazing practices continues to threaten the viability of grazing on Navajo Nation lands including those within the FBFA. Within the FBFA, all nine chapters have to varying extent active grazing and ranching practices within Chapter rangelands.

Drought has significantly impacted the quality of grazing lands throughout the FBFA which has led to a decreased quality of grazing lands within the nine chapters. Some Chapters have access to more surface and ground water sources than others which has benefited rangelands and ranching efforts within those Chapters.

Grazing is regulated by the Navajo Grazing Regulations (CFR 25, part 167). The purpose of the regulations is to preserve land and water resources on the Navajo Nation and rebuild deteriorating resources. In theory they are supposed to:

- Adjust the number of livestock to the carrying capacity (Figure 10) of the range to preserve the health and sustainability of livestock on the Navajo Nation.
- Secure increasing responsibility and participation of the Navajo people, including tribal participation in all basic policy decisions, in the sound management of grazing lands.

Grazing on the Navajo Nation requires a grazing permit issued by the BIA Superintendent and is based on the recommendations of the District Grazing Committee. The grazing regulation system, developed in 1944, divided the Navajo Nation into 19 Land Management Districts. The Navajo Nation currently has 20 grazing districts, which are organized by the BIA. Grazing lands on the Navajo Nation are organized by Land Management Districts and further into units (Figure 11).

Ranching and sheep herding have been a major occupation and an important way of life for Navajo people. The majority of land on the Navajo Nation is used for grazing by residents with homes on remote, scattered homesites or occasional family clusters (WHP 2008a, pg. 48).

Table 2: Grazing districts and Sub-Unit in Former Bennett Freeze Area.

Chapter	Grazing District	Sub-Unit
Bodaway-Gap	3	3
Cameron	3	4
Coalmine Canyon	3	1
Coppermine	1	3
Kaibeto	1	2
Leupp	5	3
Tolani Lake	5	1
Tonalea	1	1
Tuba City	3	2

**Source: Bureau of Indian Affairs, Branch of Natural Resources, WHPa (2008)*

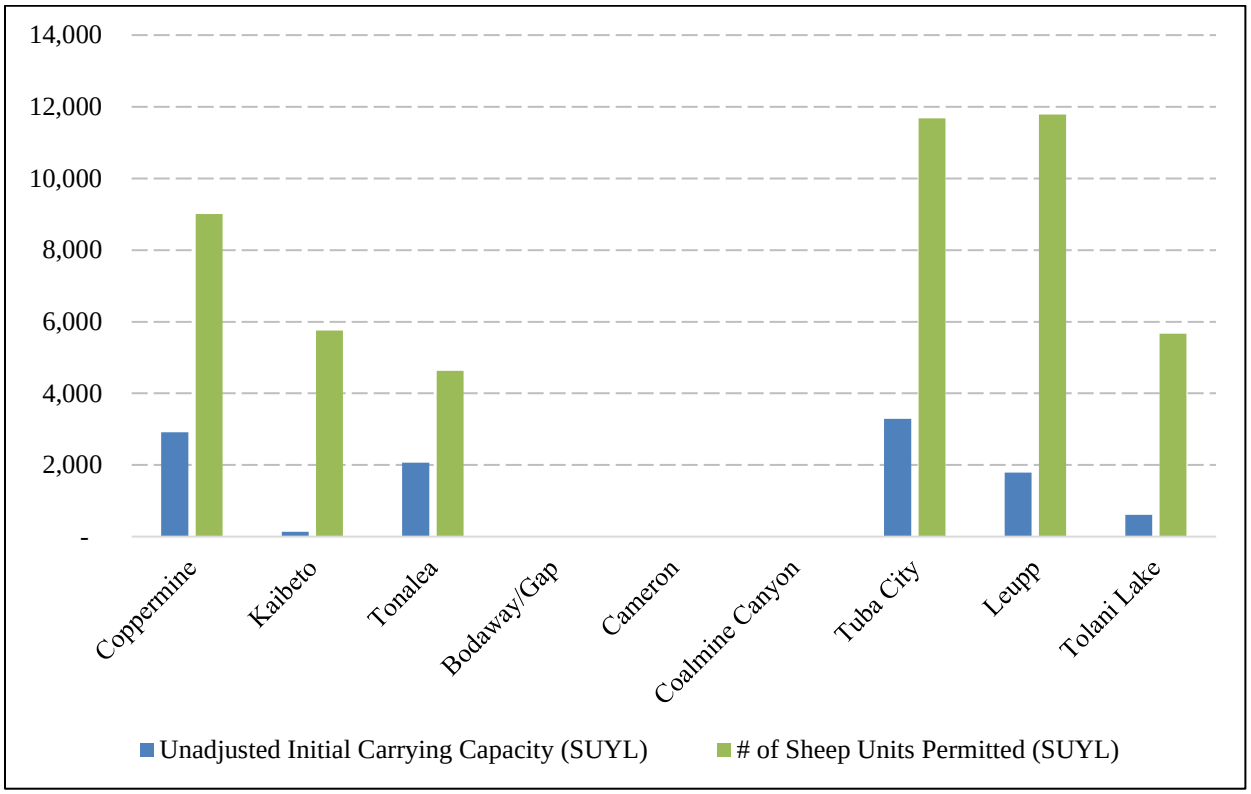


Figure 10: 2014 carrying capacity estimates* (Sheep Unit Year Long Grazing SUYL) and sheep units permitted by chapter in the FBFA. Carrying capacity data does not exist for Bodaway/Gap, Cameron, or Coalmine Canyon chapters within the Bennett Freeze Area. Estimates are based on the entire landmass of each Chapter and not the proportion of land that resides within the boundary of the FBFA. Data provided by Bureau of Indian Affairs, Natural Resources Department, Branch of Agriculture (Farm & Range).
* *Note, carry capacity estimates have not been adjusted for slope or distance to water.*

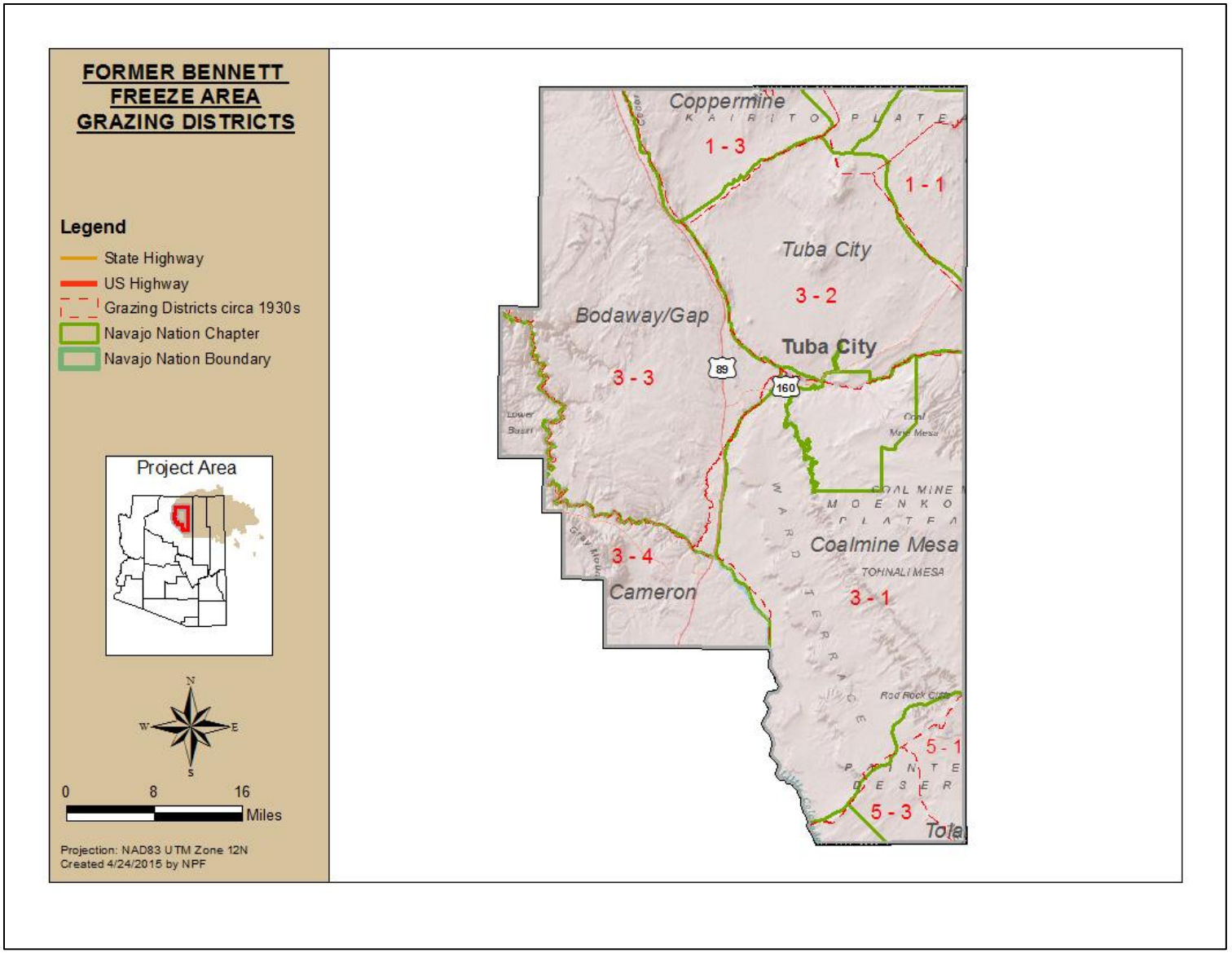


Figure 11: Bureau of Indian Affairs grazing districts and units in the Former Bennett Freeze Area. First number shown indicates the grazing district, second number indicates the unit within the district. All boundaries are circa the 1930s.

2.5.1.1 Rangeland Production Based on Soil Properties

Soil characteristics and features influence the total range production on rangelands. Rangeland productivity was evaluated using the NRCS Soil Mapping Tool to estimate the potential rangeland productivity across the FBFA. Total range production is the amount of vegetation that can be expected to grow annually in a well-managed area that is supporting the potential natural plant community. Range production includes all vegetation, whether or not it is palatable to grazing animals. The estimate includes the current year's growth of leaves, twigs, and fruits or woody plants but does not include annual increase in stem diameter of trees and shrubs. Range productivity is typically expressed in pounds per acre of air-dry vegetation.

Figure 12 shows the estimated rangeland productivity during a normal year in the FBFA. Large areas of the FBFA have similar climate and topography and thus differences in the kind and amount of vegetation produced on rangeland will be closely related to the kind of soil in the area. Figure 13 shows rangeland productivity during an unfavorable year within the FBFA. There are stark differences between the productivity estimates for an unfavorable year versus a normal year on the rangeland in the FBFA.

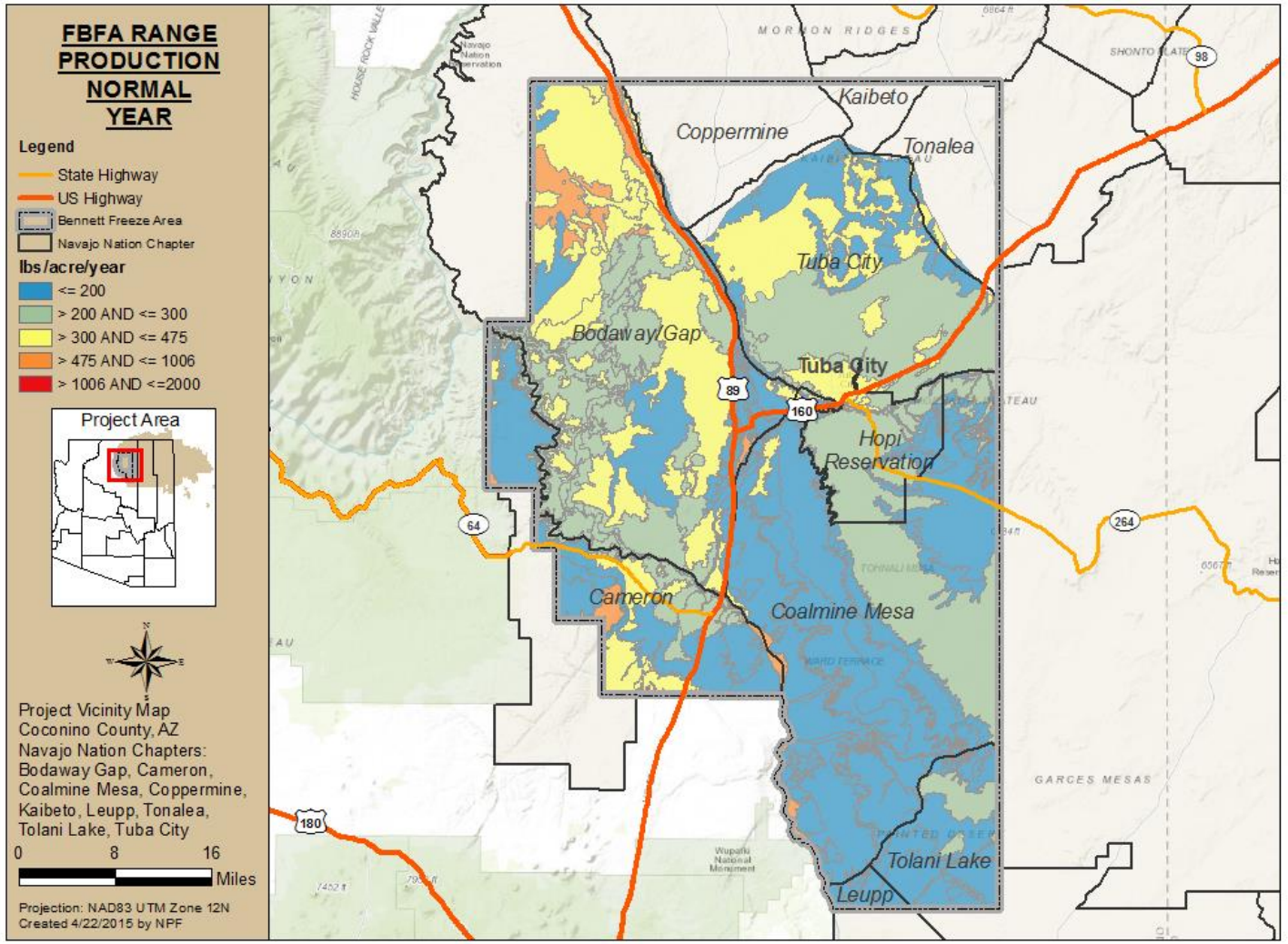


Figure 12: Rangeland productivy during a normal year in the FBFA. Productivity is measured and depicted in the map as total number of pounds per acre per year.

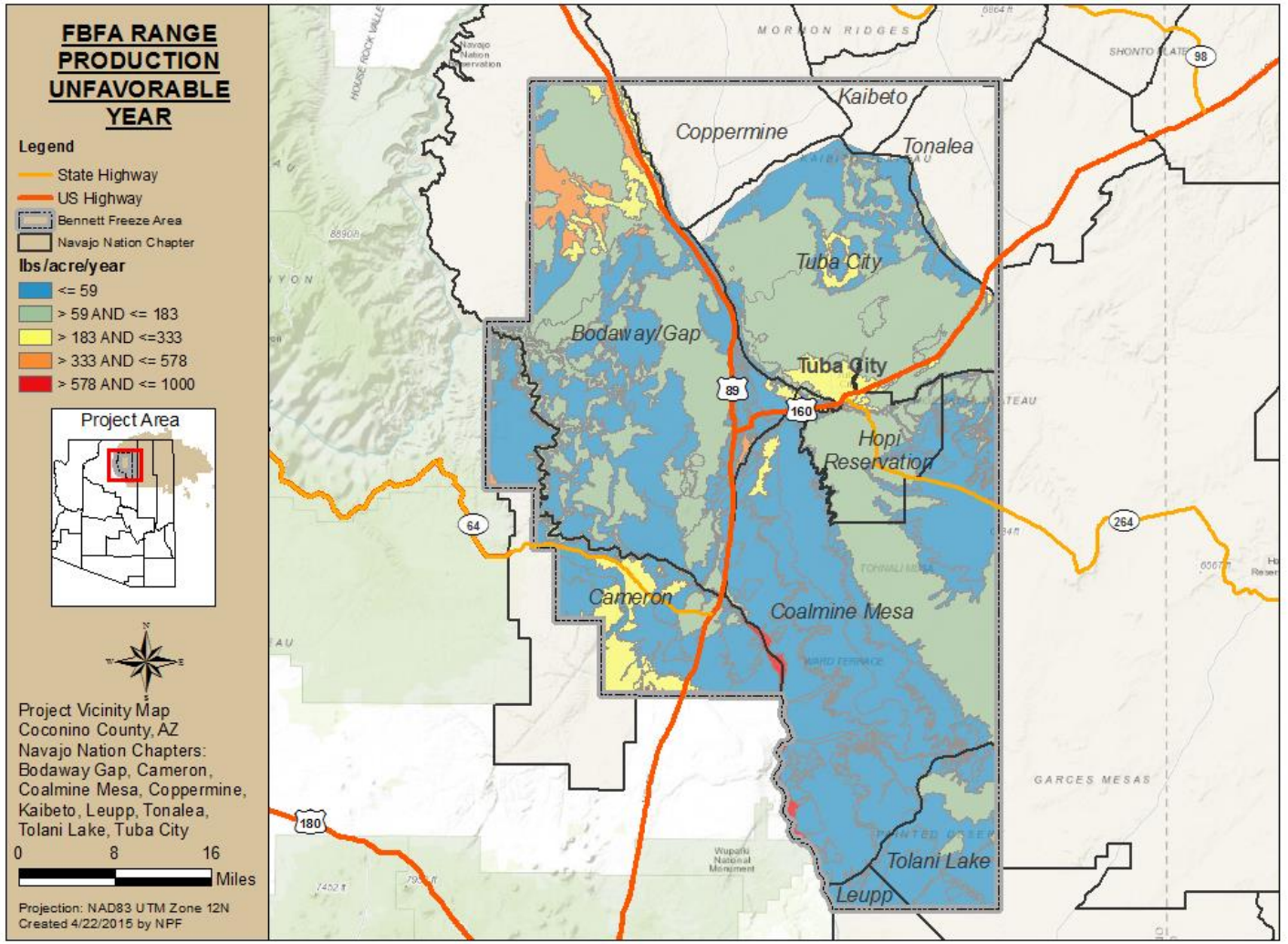


Figure 13: Rangeland productivy during an unfavorable year in the FBFA. Productivity is measured and depicted in the map as total number of pounds per acre per year.

2.1.6 Mineral Resources

The exposed rocks of the Colorado Plateau range from the Precambrian to the recent period in age (Thornbury 1965). The Navajo Section is characterized as a basin with thick layers of gently dipping Mesozoic and Cenozoic sedimentary shale, mudstone, and sandstone that contain coal seams. The area is generally characterized as rolling plains with cuestas and tablelands capped by sandstone. Canyons are typically broad and shallow. Adjacent mesas and highland areas are Cretaceous sandstones interbedded with shale. Decomposing sandstone forms the primary deposits within the upland portions of the project area. The valleys and canyon bottoms within the FBFA are comprised of Quaternary and Holocene alluvium. The geomorphology of the FBFA is primarily an area of moderate sandstone uplift and rolling ridge lines/swales. Gravels and cobbles of sandstone, shales, and limited quantities of siliceous materials are dispersed within the general region.

The Navajo Minerals Department is responsible for resources on the Navajo Reservation such as copper, coal, oil, and gas. The Navajo Minerals Department is currently located under the Navajo Division of Natural Resources. Copper and coal are found in the FBFA (WHP 2008a).

The mining of coal is a large source of revenue for the Navajo Nation. Table 3, shown below, illustrates the amount of money the Navajo Nation takes in each year (2001–2008) from mineral development in coal, oil, gas and liquefied petroleum gas (LPG).

Table 3: Navajo Nation revenue from Mineral Development (millions of dollars) (Navajo Nation Department of Economic Development)

Source	2001	2002	2003	2004	2005	2006	2007	2008
Coal	$48.90	$51.90	$63.70	$66.10	$72.04	$78.16	$59.70	$58.91
Oil	$22.42	$17.17	$19.02	$19.35	$29.00	$36.00	$27.00	$57.00
Gas	$2.10	$0.85	$1.95	$2.07	-	-	-	-
LPG	$0.17	$0.03	$0.19	$0.08	-	-	-	-
Total	$73.59	$69.25	$84.86	$87.60	$101.40	$114.16	$86.70	$115.91

The closure of several mines on the Reservation has caused a significant drop in the coal revenue for the Navajo Nation. The Black Mesa mine closed in 2006 and the Pittsburgh and Midway Coal Company closed their mine back in 2008 (Navajo Nation Department of Economic Development). These mines are not located on the FBFA, but the closure of these mines has impacted the economy of the Navajo Nation as a whole and likely those impacts were felt within the FBFA.

Oil wells located on the Navajo Reservation produced approximately 6.1 million barrels of oil in 1991. Natural gas productions on the Navajo Reservation totaled about 4.5 million MCF (one thousand cubic feet) (Navajo Nation Department of Economic Development). Table 4, below,

illustrates the mineral production on the Navajo Nation between the years 2001–2008. This table includes the amount of coal, oil, gas and LPG.

Table 4: Minerals production on the Navajo Nation (Navajo Nation Mineral's Department). Coal production measured in min. tons, oil production measured in barrels (bbls), gas million cubic feet (Mcf), natural gas liquids (LPG) in gallons.

Year	Coal	Oil	Gas	LPG
2001	23.5	5,141,285	8,625,787	1,448,707
2002	23.7	4,530,000	8,520,000	750,000
2003	24.4	4.250,000	8,100,000	800,000
2004	26.09	3,800,000	7,700,000	750,000
2005	27.5	3,490,000	2,400,000	-
2006	23.17	3,500,000	2,450,000	-
2007*	19.72	3,700,000	2,500,000	-
2008*	19.23	3,747,000	2,500,000	-

*Started 2005, Oil Revenue includes revenue from Oil, Gas and Natural Gas Liquids (NGL) previously referred to as LPG. **Started 2005, Gas includes NGL

2.1.7 Air Resources

The FBFA area is classified as a Class II airshed. Class II allows emissions of particulate matter and sulfur dioxide up to the maximum increase in concentrations of pollutants over baseline concentrations as specified in Section 163 of the Clean Air Act. Potential sources of pollution in the area include but are not limited to automobiles, wood burning stoves, and fugitive dust generated by the wind. Currently, the area is within an attainment area (does not exceed Federal air quality standards) for priority pollutants: carbon monoxide, sulphur oxides, nitrogen dioxide, lead, ozone, and particulate matter. Air quality is generally good.

2.2 Agricultural Land Use

Ranching and sheep herding are a major occupation and way of life for Navajo residents. A majority of the land on the Navajo Nation is used for grazing by residents (WHP 2008a). Currently, grazing is regulated by Navajo Grazing Regulations (CFR 25, part 167). The regulations work to preserve land and water resources on the Navajo Nation and rebuild deteriorating resources.

Overstocking and intense grazing practices continues to threaten the viability of grazing on Navajo Nation lands including those within the FBFA. Within the FBFA, all nine chapters have to varying extent active grazing and ranching practices within Chapter rangelands.

Drought has significantly impacted the quality of grazing lands throughout the FBFA which has led to a decreased quality of grazing lands within the nine chapters. Some Chapters have access to more surface and ground water sources than others which has benefited rangelands and ranching efforts within those Chapters.

2.3 Biological Resources

2.3.1 Livestock Resources (Cattle, Sheep, Horses)

The BIA Natural Resource Program is responsible for soil and water conservation on the Navajo Reservation. This is part of the BIA's responsibility to help manage livestock and range resources. The department of Resource Enforcement and the Navajo Veterinary Livestock Program in the Department of Agriculture manages and enforces livestock on the Navajo Nation. The Department of Water Resources Technical, Construction and Operations Branch (TCOB) are responsible for planning, design, constructing, and operating water infrastructure to serve ranchers. The TCOB provides livestock well facilities, irrigation systems, water lines for livestock use, and earthen stock ponds or earthen dams (WHP 2008a, pg. 112). The BIA's Natural Resources division shares responsibility for range conservation, soil and water conservation, and livestock management with the Navajo Nation's Department of Agriculture. The BIA administers grazing permits and land-use permits on several of the grazing districts.

2.3.2 Fish and Wildlife Resources

The FBFA contains four general habitats comprised of vegetation communities including, woodland, scrubland, grassland, and wetland (Figure 14). These habitats provide cover, foraging habitat, and movement corridors for animals such as mule deer (*Odocoileus hemonius*) and coyote (*Canis latrans*). These specific habitats harbor populations of wildlife species restricted to these features (Figure 15). The Navajo Nation in its entirety is host to approximately 80 vertebrate species including mammals, birds, reptiles and amphibians, and fishes (Mikesic 2008).

2.3.3 Vegetation Communities

Natural vegetation on the Navajo Nation consists of four structural types, woodland, scrubland, grassland and wetland. Each structural type is globally recognized for the life form of its visually dominant plants. Each type is habitat for its own plants and animals. Existing conditions of the vegetation describes natural history of every vegetation type that occurs on the FBFA. Existing conditions summarize our knowledge of the vegetation type's diversity, productivity, soil conditions, stages of succession and major plants' occurrence. It includes the extent and location of each type in the FBFA. Various sources of information were used to compile the description of existing conditions. These include vegetation descriptions of Arizona, Navajo Nation Inventories, government reports, and scientific journal articles. The extent and location of vegetation types were obtained from USDA GIS website and Navajo Nation mapping. Nomenclature for plant species follows USDA, NRCS the PLANTS Database (NRCS 2014).

Setting

Vegetation on the FBFA is contained within portions of Land Management District (LMD) 1, 3, and 5 with the majority of the area contained within LMD 3. Vegetation study was completed in 2015 for LMD 3 within the FBFA.

Vegetation communities in the Bennet Freeze area occur generally along an elevation gradient but are influenced by soil properties and landforms. At the highest elevations, Great Basin Conifer Woodland occurs. As elevation decreases, Great Basin Scrubland prevails, first by sagebrush (*Artemesia* spp.) and lower by fourwing saltbush (*Atriplex canascens*) and winterfat (*Krascheninnikovia lanata*). Great Basin and Plains Grasslands also occur from mid-elevations to lower elevations where soil moisture is too low to support woody plants. Imbedded in these larger areas of vegetation types are fingers of riparian forests and spots of wetlands restricted to permanent or semi-permanent water. Landforms in the Bennet Freeze area are flat or slightly tilted rock plains eroded into canyons and surmounted by buttes and mesas. The climate on the Navajo Nation is typical of the Colorado Plateau physiographic province. It is arid or semiarid with average annual precipitation ranging from 30 to 53 cm. Precipitation occurs during two distinct seasons, summer (July–September) and winter (December–March). Summer precipitation accounts for approximately 40% of the yearly precipitation and occurs as thunderstorms with short, high intensity rainfall (BIA 1995). Winter precipitation occurs generally as snowfall. High temperatures in Tuba City average 34°C in July and August and lows average −6°C in December and January.

Non-native Vegetation

The Navajo Nation reports rapid encroachment of non-native noxious weeds that destroy rangelands Navajo people rely on (NRCD 2002). Non-native plants are caused by three main causes: (1) overgrazing, (2) contaminated hay, and (3) roadside infestations. When native grasses and herbs are heavily grazed they become small and cannot compete with non-native plants. In addition, there is more bare ground available providing an opportunity for weedy species to invade. Non-native encroachment is exacerbated by drought.

Several non-native, noxious and weedy plants occur on the Navajo Nation (SEMP 2007). Other species are nearby or maybe uncommon but could pose a potential problem in the future. Some species are highly competitive, outgrowing and taking over vegetation communities. These species provide less quality forage for livestock and wildlife. Highly competitive plants also reduce populations of desirable native species. Other plant species are poisonous to livestock or reduce livestock health while others are very difficult to remove.

Four Federal noxious plants occur in Arizona (APHIS 2012), but have not been found on the Navajo Nation, hydrilla (*Hydrilla verticillata*), Syrian mesquite (*Prosopis farcta*), giant salvinia (*Salvinia molesta*) and liverseed grass (*Urochloa panicoides*). Federal species are especially prone to invasion and cause financial as well as habitat destruction. Sensitive plant species that are found or may be found within the FBFA are listed in Appendix C (Whitson 1996, AZ Dept. of Ag 2005, SEMP 2007).

Navajo Nation Important Plant Species

The Navajo Nation, in collaboration with the Navajo Fish and Wildlife Department, developed a list of culturally important plant species to both the Department and the Navajo Nation as a whole. The five most culturally important plant species identified by the Navajo Fish and Wildlife are yucca, Mesa Verde cactus, Navajo sage, piñon pine, and salt cedar.

Yucca

There are about 30 species of yucca belonging to the genus *Yucca* in the United States (Heinz Center 2011, USDA 2011), and are most commonly found growing in sands and gravels (Webber 1953, Heinz Center 2011). Some livestock and wildlife species including birds and small mammals, utilize a variety of yucca species (e.g., soapweed and banana yucca) for browse and cover (Groen 2005a, Groen 2005b, Heinz Center 2011). The Navajo people have been known to use Yucca to make soap, and the needles are used for paintbrushes and pottery. In addition, in the past yucca has been used for garments, bedding, jewelry, baskets (both weaving and waterproofing), and ceremonial purposes (Elmore 1943, Heinz Center 2011).

Mesa Verde Cactus

The Mesa Verde cactus is listed as threatened on the Navajo Endangered Species List, and was listed as threatened by the USFWS in 1979. As of 2004, cacti were restricted to San Juan County, New Mexico, and adjacent Montezuma County in Colorado with at least 70% occurring on Navajo Nation lands (NNHP 2004). A drought in 2002 severely impacted 83% of naturally occurring cacti and 89% of the transplanted cacti. Threats to the population's recovery include habitat loss due to ORV use, energy and urban development, overgrazing, as well as illegal collection and biological threats (e.g., arthropod infestations, drought; Ladyman 2004). A five-year review of the Mesa Verde cactus conducted by the USFWS in 2011 reported that there has been a 58% loss of individual cacti throughout its range since the early 2000s. There are no known populations of this species within or near the FBFA.

Navajo Sage

Navajo sage is important to the Navajo people for its ecological dominance in some areas, as well as for its ceremonial uses and medicinal properties. There are approximately 14 species of the genus *Artemisia* that occur on the Colorado Plateau, as well as numerous varieties within specific species. Sagebrush habitat is utilized for food or cover by a variety of wildlife species including large mammals and important grassland birds. Major threats to sagebrush habitat include increased fire frequency and extent, encroachment of piñon-juniper woodlands at higher elevations, invasion of cheatgrass at lower elevations, habitat conversion by anthropogenic activities, livestock grazing and movement, and energy development (Connelly et al. 2004, Heinz Center 2011). When a habitat is impacted, many of these threats may be irreversible even with aggressive management (Knick et al. 2003).

Piñon Pine

The Two-leaf or Colorado Piñon (*Pinus edulis* Engelm) covers a broad range over the southern Rocky Mountain region, and can be found between 5,000-7,000 feet in elevation. Drought has been known to have severe mortality rates on piñon pine regardless of size or age class, and can make them more susceptible to bark beetle infestations (Breshears et al. 2005, 2009). A decrease in piñon pine habitat would particularly affect small mammals and birds dependent on them as a food source, especially the pinyon jay (*Gymnorhinus cyanocephalus*), which co-evolved with piñon pine trees, and consumes piñon pine nuts as a primary food source. Piñon pines are important culturally as well as ecologically to the Navajo people as a food source and they have a U.S. market value of approximately $100 million annually (Geisler 2011).

Salt Cedar

Tamarisk was introduced to the U.S. from Asia and southeast Europe for ornamental purposes and erosion control. *Tamarix* spp. is currently found in nearly every U.S. state. Its deep roots and high water usage give it the ability to outcompete other riparian plant species, and it is difficult to eradicate because of its rapid growth and ability to spread by either seeds or cuttings (Little 1980). Biocontrol control, such as the use of the leaf beetle (*Diorhabda elongata*), has been shown to have its benefits and drawbacks, which may have served as an alternative to mechanical tamarisk removal as a benefit, but appeared to impact the southwestern willow flycatcher due to habitat loss (particularly in the absence of the willow trees it normally inhabits).

2.3.3.1 Woodland

Great Basin Conifer Woodland is characterized by stands of juniper and piñon pine trees. This plant community dominates northern and central Arizona between elevations of 5,000 and 7,000 feet, and soils tend to be thin and rocky. Junipers have invaded large regions of former Plains Grassland communities.

The evolutionary center of this woodland is in the Great Basin and is one of the most extensive vegetative types in the Southwest which extends southward through Colorado, Utah, Nevada, southeastern California, northern Arizona, and New Mexico to mountainous areas in Trans-Pecos Texas, southern New Mexico, central Arizona, and northern Baja California Norte. Rocky Mountain Juniper (*Juniperus scopulorum*) occurs in the higher and colder woodlands in Colorado, northern New Mexico and Arizona, and more locally in southern Nevada and Utah. Utah Juniper (*J. osteosperma*) may be more common in northwestern New Mexico, western Colorado, Utah, northern Arizona, Nevada, and eastern California. One-seed Juniper (*J. monosperma*) is the prevalent species in piñon-juniper woodlands in west Texas, central and southern New Mexico, and much of sub-Mogollon Arizona. Rocky Mountain piñon (*Pinus edulis*) is the common piñon pine throughout most of this biotic community.

Precipitation ranges from 250 to 500 mm per year with extremes of 180 and 560 mm, and consists of sparse rainfall more or less evenly spread throughout the year, and much of the winter precipitation falls as snow. Freezing temperatures occur approximately 150 or more days a year.

These woodlands harbor many species that rely on trees for shelter and for many, such as pinon jay, that also rely on juniper and pinon fruits and seeds as their major food source. Common species are mule deer, Uinta chipmunk, bobcat, grey fox, whiptail lizards, western rattlesnake, Cooper's hawk, Common raven, woodpecker, bushtit, juniper titmouse, and turkey (Lowe 1964).

Within conifer woodland, oak groves provide habitat for species such as Mexican big-eared bat and western scrub jay (Lowe 1964). Cliff faces and rocky areas are habitat for species such as cliff chipmunk while rocky canyons provide habitat for bighorn sheep (Alden et al. 1999). Long-eared myotis is a bat found in mines and trees above 3,000 meters. Other bats may be found in abandoned mines and caves. Arizona's only salamander, the tiger salamander, occurs in dry conifer woodlands near water where females lay eggs and the tadpoles complete their cycle into adults (Alden et al. 1999).

2.3.3.2 Shrubland

The Great Basin Desert evolved from both cold-temperate and warm-temperate vegetation, and it is the northernmost of the four North American deserts. Dominant plants having cold-temperate affinities include sagebrushes (*Artemisia* spp.), saltbushes (*Atriplex* spp.), and winterfat (*Ceratoides lanata*), and dominants of warmer climates included rabbitbrush (*Chrysothamnus* spp.) blackbrush (*Coleogyne* sp.), hopsage (*Grayia* sp.), and horsebrush (*Tetradymia* sp.).

It occupies approximately 59,570 km^2 at elevations mostly between 1,200 meters and 2,200 meters (occasionally even higher to 2,600 meters). Most of the desert receives less than 250 mm of precipitation per year, showing a strong winter dominated pattern on the west, with a gradual shift eastward toward a stronger summer influence with wet and dry seasons that is less distinct than the other deserts (Turner 1982).

Great Basin Desert Scrubland is characterized by species that use sagebrush and other shrubs for food and shelter. Vertebrate diversity is low compared to other habitat types. Mammalian species found in this habitat are pronghorn, coyote, black-tailed hare, antelope ground squirrel, mice, Mexican free-tailed bat and western pipistrelle bat (West 1983; Lowe 1964). Birds include sage thrasher, sagebrush sparrow and predators such as golden eagle, great horned owl and Cooper's hawk. Common reptiles are sagebrush lizard, whiptail lizard, striped racer and gopher snake. Bat species, such as Yuma myotis roost and breed in caves and old mines. These habitats are also home to cave-restricted invertebrates (Turner 1982).

Invertebrate diversity is high (West 1983). Outbreaks of insects such as cicadas are a normal cycle in scrubland habitat, providing food for many vertebrate species and potentially increasing

understory plant diversity. Notably, outbreaks of a common, sagebrush-eating moth webworm (*Aroga websteri*) occur.

Great Basin Desert Scrubland is an evergreen, shrub-dominated community occurring between 900 and 2000 meters (Lowe 1973). There are 434,785 ha of this scrubland on the project site. It develops in many soil types that are fine-grained, moderately well drained, deep and nonsaline. It is found on generally flat or undulating terrain. Two types of Great Basin Desert Scrubland occur on the Colorado Plateau in northern Arizona, Sagebrush and Shadscale (Brown 1982). Sagebrush dominated scrubland is 0.3–10.0 meters tall. It is characterized by big sagebrush (*Artemesia tridentata*) but can share sites with other shrubs such as rabbitbrush (*Ericameria nauseosa*), winterfat, mormon tea and Torrey joint fir (*Ephedra torryana*) (Lowe 1973, Turner 1982). Patchy perennial grasses are the understory along with Whipples prickly pears (*Opuntia whipplei*) and ragwort (*Senecio flaccidus*), while annual grasses are common in wet years.

Great Basin Desert Scrubland also includes Shadscale which occurs along drainages of the Little Colorado River in elevations from 900 to 1,500 m (Brown 1985) Shadscale is short and very open vegetation with covers of 10%–25%. Shadscale (*Atriplex confertifolia*) is the main species but other frequent shrub species are Artemesia spinescens, Sarcobatus vermiculatus, *Ephedra nevadensis*, *Gayia spinosa* and saltbush. The understory is widely scattered perennial grass such as James' galleta (*Pleuraphis jamesii*), squirreltail (*Elymus elymoidese*), desert needlegrass (*Stipa speciosa*), and alkali sacaton (*Sporobolus airoides*).

A scrubland community may be found around internal drainage basins where soils become salty (Lowe 1973). These shrublands are dominated by salt-tolerant shrubs. Their understories consist of salt-tolerant grasses and herbs.

2.3.3.3 Grassland

It can be difficult to make clear distinctions between desertscrub and grassland zones because the desertscrub has invaded the grasslands in many areas. The plains and Great Basin grassland biotic community was formerly an open, grass-dominated landscape in which the grasses formed a continuous or nearly uninterrupted cover, but these grasslands are now much altered. The Plains grassland is situated largely on high level plains, in valleys, and on intervening and adjacent low hillsides, rises, ridges, and mesas in what is predominantly flat and open country. Therefore they are situated on open and exposed plains, subject to high solar radiation and long windy periods, particularly during winter and early spring. Plains grasslands in the Southwest occur above 1,200 meters elevation. In southwestern New Mexico, southeastern Arizona, and northeastern Sonora, this grassland is mostly restricted to elevations above 1,500 meters. The upper elevation limits are typically at 2,200–2,300 meters. Precipitation averages between 300 mm and 460 mm per annum, with extremes to as low as 250 mm and as high as 530 mm within plains grassland communities. The Plains and Great Basin grassland consist primarily of short

grama grass species, and are interspersed with Russian thistle, narrow-leaf yucca, prickly pear, and cholla (Brown 1985).

Grasslands occur between 1,500 and 2,100 meters and many of the shrubland wildlife species also occur here such as coyote, red-tailed hawk, and gopher snake (Lowe 1964). Grasslands may have been the home of Gunnison's prairie dogs, whose populations are now greatly reduced by habitat alteration, systematic extermination and plague. Prairie dogs are important ecosystem engineers and are considered a keystone species in the habitats where they are found. Gunnison's prairie dogs provide homes for many species of insects, snakes and mice, and they create nests that burrowing owls and black-footed ferrets use for their own nests. Predators such as ferrets, badgers and hawks rely on prairie dogs as a major food source.

Apache pocket mice, Ord's kangaroo rat, ferruginous hawk, horned lark, western meadowlark and lark sparrow are a sample of species restricted to grassland habitats. Marsh hawks commonly use grasslands for wintering habitat. Red-spotted toad, one of the few amphibians occurring in Arizona, is found in grasslands where seeps and livestock tanks hold water during the aquatic stages (Alden et al. 1999)

2.3.3.4 Riparian Forest

Wetland vegetation, including riparian forest, is the most productive community in Arizona. Wetlands support the highest diversity of animals compared to all other Arizona habitats. Some species are endemic to specific wetland vegetation types. Rocky Mountain deciduous woodland is a riparian forest characterized by tall, winter-deciduous broadleaf trees restricted to stream banks and the periphery of lakes and ponds. Species restricted to the woodlands are western screech owl (*Megascops kennicottii*), yellow-billed cuckoo (*Coccyzus americanus*), southwestern willow flycatcher (*Empidonax traillii extimus*), canyon tree frog (*Hyla arenicolor*), and Woodhouse's toad (*Anaxyrus woodhousii*).

2.3.3.5 Wetland and Open Water

Marshes occur in ponds, lakes, reservoirs, springs, seeps, farm ponds and slow-moving watercourses. Bald eagles are found in northern Arizona near lakes and streams (Lowe 1964). Beaver occur along permanent streams and raccoon along Little Colorado River. Many shorebirds and waterfowl are restricted to these habitats for breeding or wintering habitat (Brown 1985). These habitat types are also important stopovers for migrating birds during spring and fall. Other species restricted to these habitats are northern leopard frog, terrestrial garter snake and muskrat.

Open water habitat includes ponds, lakes and reservoirs generally with vegetation surrounding them. Fish occur in each of these habitats and each species is restricted to specific environmental features (Lowe 1964; Alden et al. 1999). Colorado chub, Colorado squawfish and bluehead

sucker are found in cold water drainages of the Colorado River. Speckled dace occur above 2,000 meters in creeks and rivers. Black bullhead can be found in warm water such as stock tanks, ponds and ditches. In Arizona, many non-native fish species were introduced to open water habitats during the 20th century. Today, only a few isolated mountain streams contain only native fish species. Non-native fish populations are now more numerous than native because they are repeatedly reintroduced into recreation areas, they outcompete native fish for food, and they are veracious predators of native fish and amphibians.

2.3.3.6 Resource Concentration Protection Areas

Navajo Fish and Wildlife Department (NNDFW) has prepared a development planning tool to avoid biologically sensitive areas throughout the Navajo Nation. Areas on the Navajo Nation are categorized according to the potential impact of development on wildlife and their habitats in those areas, and this designation is part of the Biological Resource Land Use Clearance Policies and Procedures (Figure 15). See Figure 15 for designated areas within the FBFA. Rankings include the following:

- *High Sensitive Areas*—areas contain the best habitat for endangered and rare plant, animal and game species, and the highest concentration of these species on the Navajo Nation. Development in these areas requires the preparation of a Biological Evaluation; however, as a general rule, planned activity or developments that will result in significant impacts to wildlife resources should be avoided.
- *Moderately Sensitive Areas*—areas that contain a high concentration of rare, endangered, sensitive, and game species occurrences or has a high potential for these species to occur throughout the landscape. The purpose of this designation or ranking is to minimize impacts on these species and their habitats, and to ensure the habitats do not become fragmented. Planned activities or developments on this land requires a Biological Evaluation.
- *Less Sensitive Areas*—areas that have a low, fragmented concentrations of species of concern. The species in this area may be locally abundant in small pockets of habitat across the landscape. All developments in the area will require a Biological Evaluation prior to any activity on the land.
- *Community Development Areas*—areas around some communities that have been determined to not support habitat for species of concern and therefore development can proceed without further biological evaluation. NNDFW recommends that project sponsors attempt to locate projects within Community Development Areas.
- *Biological Preserve Areas*—areas that contain excellent, or potentially excellent, wildlife habitat and are recommended by NNDFW for protection from most human-related activities, and in some cases are recommended for enhancement. No new activity or development is allowed within these Preserves, unless it is compatible with management goals for the area. This does not include approved pre-existing activities.

Priority Habitats for Management

The top five habitats in ranked order include biological preserves, mountain ponds and springs, high elevation/mountain grasslands and meadows, piñon-juniper woodlands, and lakes. Other important habitat areas that were placed immediately behind the top five list include Ponderosa pine forests, the San Juan River, Carrizo Mountains, raptor-sensitive areas, and canyon areas.

Biological Preserves

Biological preserves are areas that contain excellent wildlife habitat, or have excellent potential, and are recommended for protection from most anthropogenic activities by the Department, and in some cases are recommended for enhancement (Heinz Center 2011, NNCRC 2008). New activity and development is prohibited on biological preserves unless it is compatible with management goals for the area; they may host a haven for many wildlife and plant species including threatened and endangered, and keystone species.

Long-term goals for biological preserves include addressing the lack of scientific data, determining their traditional uses and cultural importance to the Navajo people, addressing inadequate management, focusing on climate change research and monitoring, as well as coordinating proposed development and economic development plans within Biological Preserves.

Ponds and Springs

Numerous ponds and springs are found in the Chuska and Carrizo mountain ranges, and they support a wide spectrum of wildlife. Pressures to these important ecosystems may include climate change, grazing, habitat conversion, invasive species, recreational use, and increased infrastructure (AZGFD 2006, Heinz Center 2011).

Long-term objectives for mountain ponds and streams include their protection and restoration. This would be accomplished by identifying locations with the greatest need for protection/restoration with emphasis on endangered species. In addition with contribution from stakeholders, efforts would determine if additional preservers should be created and their proposed location(s), as well as establish management actions for preserves and develop restoration projects.

Grasslands and Meadows

High-elevation grasslands were once prime grazing lands, but pressures such as overgrazing (e.g., livestock and wild horses), altered fire regimes, and climate change have resulted in lower quality grazing areas and have allowed encroachment of invasive shrubs and conifers. These areas are important to the NNDFW for their use by a variety of wildlife species, as well as by the Navajo Nation for livestock and sheep grazing.

Long-term objectives for high elevation mountain grasslands and meadows include their conservation and restoration, which would be accomplished by establishing a monitoring plan, developing education and outreach programs, and establishing pilot projects.

Piñon–Juniper Woodlands

In some areas of the Colorado Plateau ecoregion, juniper has invaded sections that were once dominated primarily by grasses, while piñon pine populations have declined in recent years due to drought and insect infestation (AZGFD 2006, Heinz Center 2011). Other contributing changes to piñon-juniper woodlands include non-native species invasion, fire suppression, and overgrazing. Piñon-juniper woodlands are important to the Navajo people as a source of wood, for tree needles and ashes that are used in ceremonies, as well as for the gum found in the trees which has several traditional uses.

Long-term objectives for piñon–juniper woodlands include preserving woodland areas for wildlife habitat and Navajo cultural resources. This would be accomplished by developing and implementing management plans, study projects, education and outreach programs, and partnerships to coordinate management issues.

Lakes

There are over a dozen lakes utilized for fishing that are located throughout the Navajo Nation and managed by the Navajo Nation Department Fish and Wildlife. These fishing lakes are valued for sport fish species, such as rainbow trout, catfish, bass, pike, and crappies, as well as for wildlife such as bald eagles, which can be found near fishing lakes. In addition, some lakes are used for agricultural irrigation.

Long-term goals for lakes on the Navajo Nation include maintaining them for various outdoor recreational opportunities for future generations. This would be accomplished by developing management plans and activities, research, as well as addressing livestock issues and community involvement.

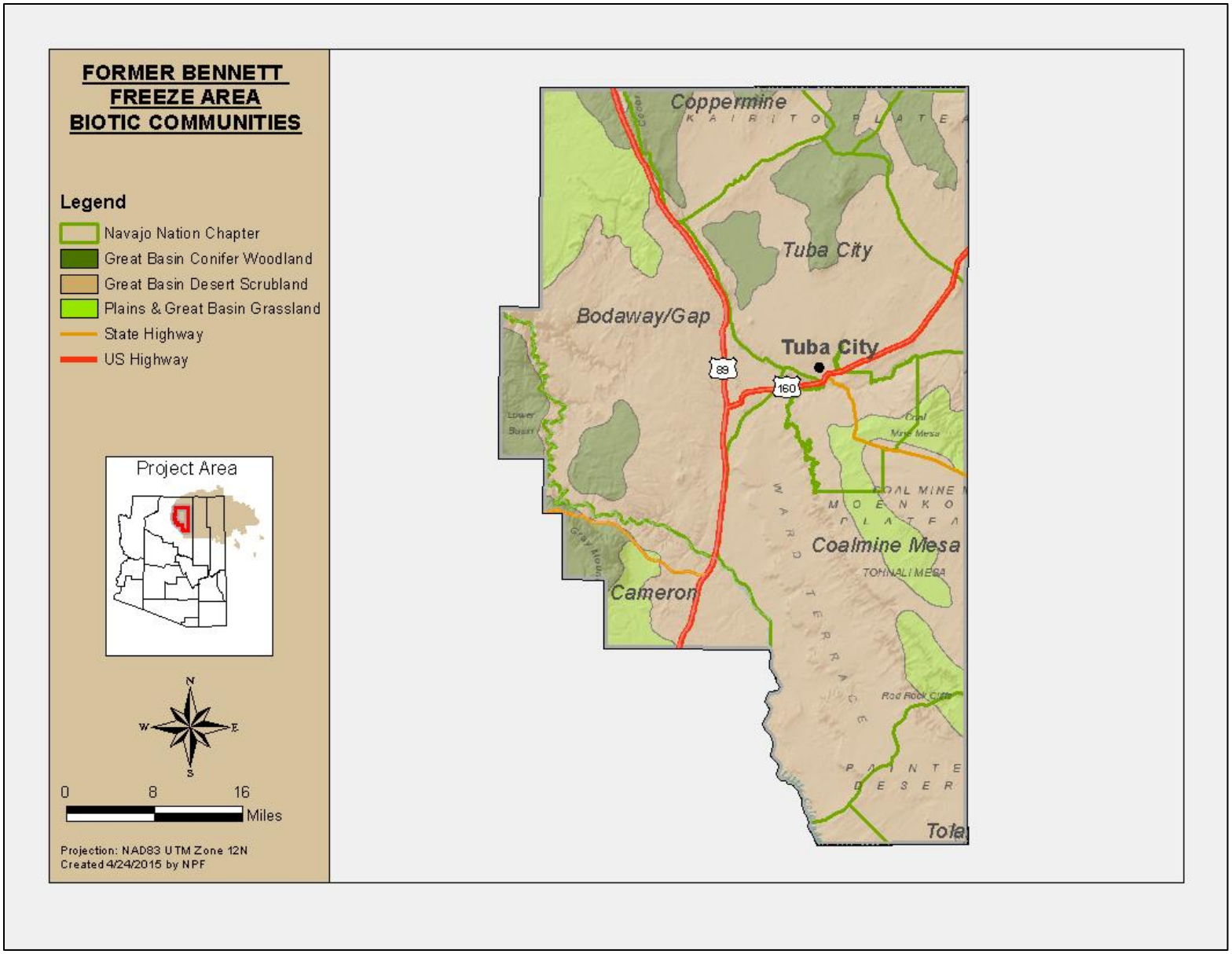


Figure 14: Biotic Communities within the Former Bennett Freeze Area.

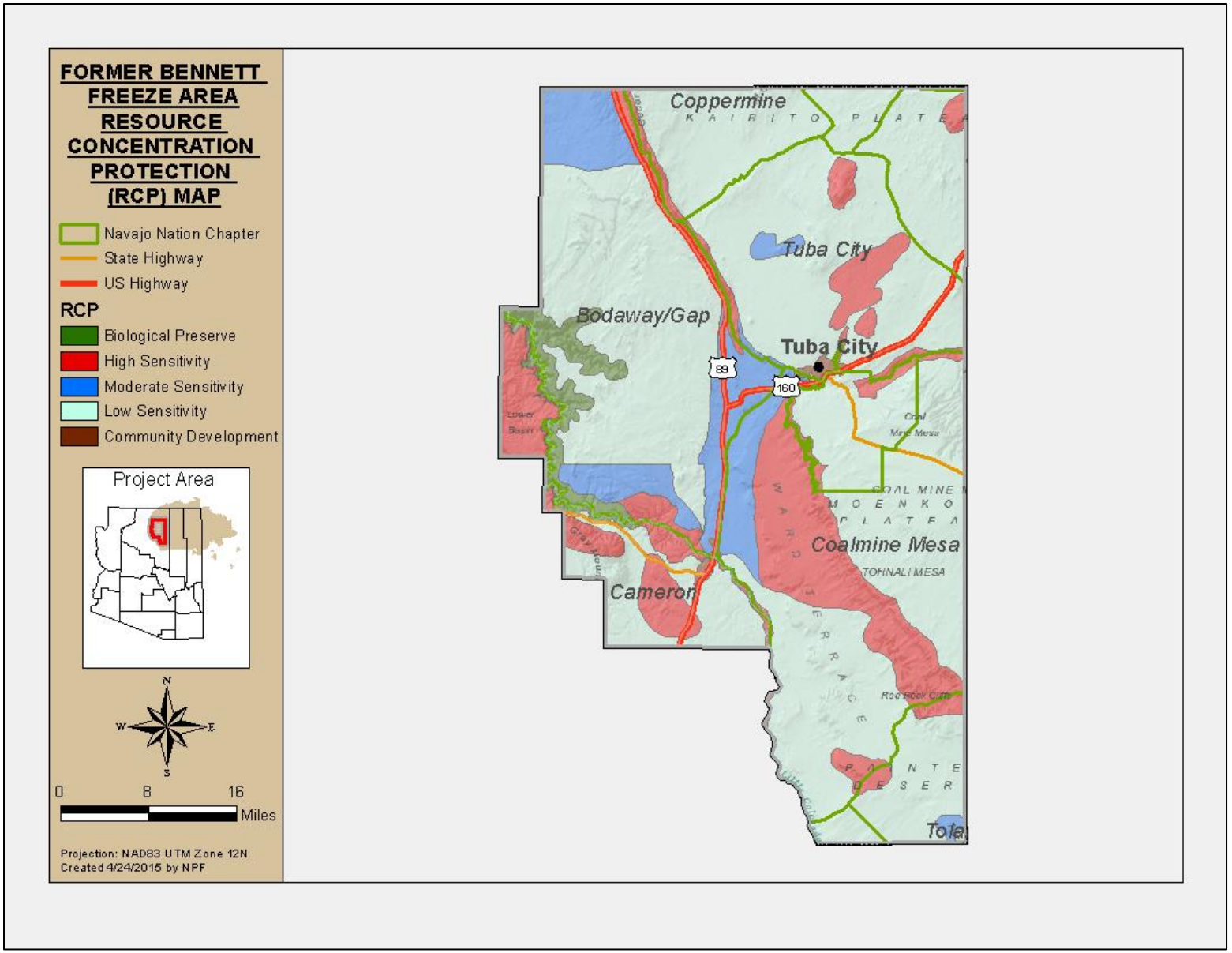


Figure 15: Resource Concentration Protection Designations within the Former Bennett Freeze Area.

2.3.4 Forests

Table 5: Forest types and total acreage found within the Former Bennett Freeze Area.

Chapter	Woodland Acres	Chapter Acres	Juniper	Juniper–piñon	Piñon	Piñon–juniper	Ponderosa Pine	Woodlands w/in Commercial Forest	Commercial Forest	Non-forest
Bodaway-Gap	28,032	561,534	28,010	15	0	7	–	–	–	427,644
Cameron	37,979	236,785	4,680	15,726	0	17,573	–	–	–	198,639
Coalmine Canyon	3,204	405,485	3,204	0	0	0	–	–	–	402,210
Coppermine	120,795	244,426	68,350	43,670	0	8,776	–	–	–	122,354
Kaibeto	106,681	237,158	60,856	23,088	0	22,737	–	–	–	130,477
Leupp	4,094	295,658	4,094	0	0	0	–	–	–	291,294
Tolani Lake	11,217	150,944	11,217	0	0	0	–	–	–	139,644
Tonalea	49,113	150,617	31,556	16,776	0	781	–	–	–	100,027
Tuba City	69,278	227,921	66,425	1,946	0	906	–	–	–	158,639

2.4 Cultural Resources

2.4.1 Historic and Archaeological Resources

Section 106 of the National Historic Preservation Act (NHPA) requires agencies to take into account the effects of proposed undertakings on historic properties. The BIA is the lead federal agency for Section 106 review of the majority of undertakings on the Navajo Reservation. The NNHHPD maintains records of cultural resources investigations and recorded cultural resources properties within lands administered by that office.

The NHPA sets forth government policy and procedures regarding "historic properties"—that is, districts, sites, buildings, structures, and objects included in or eligible for listing in the National Register of Historic Places (NRHP). Existing federal, state and tribal laws and rules protect archaeological sites, historic properties and graves. These laws and rules include the Federal Antiquities Act of 1906 (P.L. 59–209); the National Historic Preservation Act (P.L. 89–665); the National Environmental Protection Act of 1969 Executive Order 11953; "Protection and Enhancement of the Cultural Environment," May 13, 1971 (36 C.F.R. 8921); the Archaeological Resources Protection Act of 1978 (P.L. 95–96); the American Indian Religious Freedom Act of 1978 (P.L. 95–341); the Native American Graves Protection and Repatriation Act (NAGPRA); Arizona laws protecting human remains on private lands; the Navajo Nation Policies and Procedures Concerning Protection of Cemeteries, Gravesites, and Human Remains of 1986 (ACMA-39–86); and the Navajo Nation Cultural Resources Protection Act (CMY-19–88) (http://www.hpd.navajo-nsn.gov/files/5.0_TCP_Policy.pdf).

Cultural resources are evaluated based on whether they meet the eligibility criteria required for listing in the NRHP (National Register Bulletin #15). Section 106 of the NHPA requires that Federal agencies consider the effects of their actions on such properties, following regulations issued by the Advisory Council on Historic Preservation (36 CFR 800).

The NNHHPD maintains records of cultural resources investigations and cultural resources properties within lands administered by that office. However, due to the constraints imposed by the Bennett Freeze Act, during which time limited infrastructure maintenance or new construction occurred, few cultural resource surveys were conducted in the area for over 50 years and documentation of known properties is limited.

The NNHHPD has been tasked with compiling information about known cultural resources in the FBFA. Prior to any proposed undertaking in the FBFA that has the potential to disturb or otherwise impact historic or archaeological sites, review of documentation compiled by NNHHPD and cultural resource inventories by archaeologists will result in cultural resource management guidance for the proponent of the undertaking.

2.4.2 Traditional Cultural Properties

The NNHHPD Traditional Cultural Property (TCP) division maintains a database of known traditional cultural properties on the Navajo Nation. A TCP is a property that is eligible for inclusion in the NRHP based on its associations with the cultural practices, traditions, beliefs, lifeways, arts, crafts, or social institutions of a living community. TCPs are rooted in a traditional community's history and are important in maintaining the continuing cultural identity of the community. The cultural practices or beliefs that give a TCP its significance are, in many cases, still observed at the time a TCP is considered for inclusion in the NRHP. Because of this, it is sometimes perceived that the practices or beliefs themselves, not the property, make up the TCP. While the beliefs or practices associated with a TCP are of central importance, the NRHP does not include intangible resources. The TCP must be a physical property or place--that is, a district, site, building, structure, or object (https://www.nps.gov/history/tribes/Documents/TCP.pdf.).

TCPs are subject to meeting NRHP criteria. As with historic and archaeological sites, known TCPs will be reviewed at the NNHHPD and ethnographic surveys will be conducted to provide guidance prior to any proposed undertaking.

2.4.3 Navajo Nation Policy for the Protection of Jishchaa': Gravesites, Human Remains, and Funerary Items

The Jishchaa' policy was implemented pursuant to the Navajo Nation Cultural Resources Protection Act (CRPA, CMY-19–88). It is intended to complement provisions set forth in the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA, P.L. 101–601), the Archaeological Resources Protection Act of 1979 (ARPA, P.L. 96–95), the National Historic Preservation Act of 1966 (NHPA, P.L. 89–665, as amended), and others. The Navajo Nation requires a proponent a of proposed undertaking to make a good faith effort to locate gravesites, human remains, and funerary items within the area of potential effect prior to initiation of an undertaking. Such efforts shall include: (1) file searches of existing information, including files maintained at NNHHPD, mission records, and other pertinent materials as appropriate; (2) archaeological inventory and ethnographic interviews with residents of the local community and with other knowledgeable individuals. Navajo Nation permitting procedures require that investigators contact local chapters prior to initiating field activities (Navajo Nation Policy To Protect Traditional Cultural Properties 1989); and (3) other approaches, such as traditional diagnostic techniques, as necessary or appropriate (http://www.hpd.navajo-nsn.gov/files/6.1_Jishchaa_Policy.pdf).

If Jishchaa are encountered during a cultural resource inventory, guidance and management recommendations for proposed undertakings will be developed in consultation with the NNHHD.

2.5 Socioeconomic Resources

The project area is entirely located on the Navajo Nation Reservation lands. The project area lies within the boundaries of nine (9) different chapters and they include: Bodaway/Gap, Cameron, Coalmine Canyon, Coppermine, Kaibeto, Leupp, Tolani Lake, Tonalea and Tuba City. Because

of this, the populations of the different chapters will be discussed and the population of the Navajo Nation will be discussed as well.

2.5.1 Navajo Nation

The median household income for the Navajo Nation is $27,389, which is approximately half of that of the State of Arizona which is $51,310 overall. (US Census 2010).
Table 6 below compares the different median household incomes in Arizona and of those on the Navajo Nation reservation.

Table 6: Median household income for the Navajo Nation. Household income is presented in 2010 inflation-adjusted dollars.

Household Income (2010 Inflation-Adjusted)	Arizona		Navajo Nation	
Total households	**25,115**	**%**	**43, 398**	**%**
Less than $10,000	5,911	24%	10,188	23%
$10,000 to $14,999	2,236	9%	3,877	9%
$15,000 to $24,999	4,063	16%	7,032	16%
$25,000 to $34,999	2,877	11%	5,133	12%
$35,000 to 49,999	3,239	13%	5,674	13%
$50,000 to $74,999	3,529	14%	5,816	13%
$75,000 to $99,999	1,718	7%	3,247	7%
$100,000 to $149,999	1,164	5%	1,923	4%
$150,000 to $199,999	222	1%	306	1%
$200,000 or more	156	1%	202	0%

**Source: United States Census Bureau, 2010*

The household income by Chapter varies greatly. For most living in the FBFA, median household income ranges less than $10,000 to upwards of $75,000 and in some cases upwards of $99,000 (Table 7).

Table 7: Median household income by Chapter within the Former Bennett Freeze Area

Income by Chapter	Bodaway Gap	Cameron	Coalmine Canyon	Coppermine	Kaibeto	Leupp	Tolani Lake	Tonalea	Tuba City
Less than $10,000	25.20%	37.90%	36.40%	19.10%	14.00%	3.80%	9.20%	27.40%	8.60%
$10,000 to $14,999	14.20%	3.50%	11.10%	2.60%	4.60%	12.80%	11.20%	3.40%	2.80%
$15,000 to $24,999	12.60%	13.60%	4.00%	7.80%	24.70%	16.20%	19.10%	10.20%	11.30%
$25,000 to $34,999	20.90%	10.10%	0.00%	7.00%	11.70%	10.90%	24.30%	9.20%	12.10%
$35,000 to $49,999	9.40%	16.60%	26.30%	29.60%	17.60%	15.90%	8.60%	19.40%	22.30%
$50,000 to $74,999	9.40%	4.10%	13.10%	26.10%	12.10%	19.70%	5.30%	13.20%	17.60%
$75,000 to $99,999	8.30%	7.40%	0.00%	7.80%	11.10%	19.50%	6.60%	11.80%	11.40%
$100,000 to $149,000	0.00%	1.40%	4.00%	0.00%	4.20%	1.20%	15.80%	4.50%	8.70%
$150,000 to $199,999	0.00%	4.10%	5.10%	0.00%	0.00%	0.00%	0.00%	0.90%	2.60%
$200,000 or more	0.00%	1.40%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.50%

**Source: United States American Community Survey, 2010*

Table 8 below illustrates the median household income by Chapter. The median household income varies among each of the chapters. Residents in Cameron Chapter have the lowest median income of all the Chapters within the FBFA; however, only a portion of the Chapter is actually located within the boundary of the freeze area. Coppermine residents maintain the highest median household income within the FBFA (USACS 2010).

Table 8: Median household income by Chapter within the Former Bennett Freeze Area.

Chapter	Income
Bodaway Gap	$26,154
Cameron	$23,068
Coalmine Canyon	$39,821
Coppermine	$47,143
Kaibeto	$34,583
Leupp	$42,411
Tolani Lake	$29,926
Tonalea	$35,444
Tuba City	$44,107

Poverty rates on the Navajo Nation Reservation are more than twice as high as the rates in the State of Arizona. The Navajo Nation has a poverty rate of thirty-eight percent (38%) and the State of Arizona has a poverty rate of fifteen percent (15%) (AZ Rural Poverty Institute, et al. 2010).

Table 9: Poverty status on the Navajo Nation (ACS 2010 5-year estimates)

	Arizona	%	New Mexico	%	Utah	%	Total Navajo Nation	%
Poverty status determined	98,106		64,143		6,212		168,461	
Below poverty level	37,063	38%	24,039	37%	2,442	39%	63,544	38%
Poverty status determined under 18	33,700		20,752		2,226		56,678	
Persons under 18 in poverty	14,589	43%	9,281	45%	924	42%	24,794	44%
Persons aged 18 to 64 for whom poverty status is determined	54,970		37,731		3,558		96,259	
Persons aged 18 to 64 in poverty	18,888	34%	12,475	33%	1,304	37%	32,667	34%
Persons over 65 for whom poverty status is determined	9,436		5,660		428		15,524	
Persons over 65 in poverty	3,586	38%	2,283	40%	214	50%	6,083	39%
Persons in families for whom poverty status is determined	87,592		57,241		5,684		150,517	
Persons in families in poverty	30,639	35%	19,971	35%	2,181	38%	52,791	35%
Unrelated persons in poverty	6,424	7%	4,068	6%	261	4%	10,753	6%

**Source: ACS 2010, 5 Year Estimates*

The Census Bureau uses a ratio to compute the poverty ratio. The ratio is calculated by comparing a person's income with their poverty threshold, and this in turn becomes the poverty ratio. The ratio of income to poverty is used to measure the degree of poverty in which a household is living. An example would be: a poverty ratio of 1.0 means a person is living right on the poverty line; a ratio of 0.5 would mean that a person is living in a household making only half the income designated as the poverty threshold. The Census Bureau describes those with incomes below one half of their poverty threshold as being "severely poor." Households with incomes at or above their threshold but below 125 percent of their threshold are classified as "near poor" (AZ Rural Poverty Institute, et al. 2010).

More than thirty-eight percent (38%) of the people located on the Navajo Nation reservation are classified as "severely poor," with poverty ratios that range from 0.5 to 0.99. These rates are more than twice as high as those of the State of Arizona which is fifteen percent (15%). Twenty-nine percent (29%) of people on the Navajo Nation Reservation are classified as above the poverty line with poverty ratios between 1 and 2. The information presented indicates that thirty-eight percent (38%) of the households are below the poverty line, while the remaining sixty-two percent (62%) are located above the poverty line. Table 10 shows the poverty ratios for the Navajo Nation and the table breaks down the poverty ratios by the state of Arizona, as the FBFA is located within the State of Arizona.

Table 10: Poverty ratio population comparison between the state of Arizona and Navajo Nation.

	Arizona		Total Navajo Nation	
Total Persons	98,642	%	169,052	%
Poverty Ratio Under 0.5	18,481	19%	31,292	19%
Poverty Ratio in 0.5 to 0.99	18,582	19%	32,252	19%
Poverty Ratio in 1 to 2	28,426	29%	48,218	29%
Poverty Ratio in 2 and over	32,617	33%	56,699	34%

**Source: United States Census Bureau, 2010*

There are 120,444 Navajo people over 16 years of age in the 2010 Census. Of that number, 67,361, or fifty-six percent (56%), are not in the labor force (US Census 2010). Primary employers of the Navajo Nation are educational services, health care, and social assistance, retail, manufacturing, and public administration (USACS 2010).

Table 11 depicts the percentage of people who have an income below the poverty level. Bodaway Gap Chapter has the highest amount of people who have an income below the poverty level at 49.43%. Leupp had the least amount of people living with an income below poverty level at 18.58% (USACS 2010).

Table 11: Percentage of persons with a median household income below the poverty level in each chapter within the FBFA.

Chapter	%
Bodaway Gap	49.43%
Cameron	46.06%
Coalmine Mesa	28.66%
Coppermine	44.82%
Kaibeto	29.55%
Leupp	18.58%
Tolani Lake	45.89%
Tonalea	24.79%
Tuba City	23.94%

2.5.2 Economic Framework

There are two sources of income for the Navajo Nation. The first source includes internal sources of revenue. Internal sources of revenue for the Navajo Nation include: mining of coal, taxes on the Navajo Nation, and revenue from the various casinos on the Navajo Nation. The second source includes external sources of revenue. External sources of revenue include federal, state, private and other funds. These funds are mostly in the form of grants. Some of the funds also come in the form of services, e.g., medical and educational services. Welfare benefits to the Navajo people are also included in this category. The External Fund accounts for a large portion of the total Navajo Nation Budget.

Home sites

In the 2008 FBFA Recovery Plan, WHPacific coordinated a field team to find and count the number of houses that lie within the FBFA boundary. This was done because Census Data does not allow the comparison of Chapter population inside and outside the FBFA using GPS Technology. While not every home may have been visited by a field team, and some houses may have been inaccurately classified as either occupied or unoccupied, a large enough sample was gathered to be able to produce a statistically meaningful ratio of residents residing inside and outside the FBFA (WHP 2008a, pg. 130).

Using the field team data, the analysis applied the ratio of population per household to the number of occupied homes inside and outside the FBFA boundary. This calculation produced an estimate of the percentage of population and homes in and out of the FBFA within each Chapter. These percentages were used to calculate how many homes inside and outside the FBFA boundary would be needed to meet the housing demand by 2020, in each of the housing project categories described below (WHP 2008a, pg. 130).

These same percentages were also used to show the portion of FBFA residents in any chapter who will benefit from capital projects located anywhere in the chapter.

Table 12: Houses by Chapter Based on Field Surveys

Houses	All	Bodaway- Gap	Cameron	Coalmine Canyon	Coppermine	Kaibeto	Leupp	Tolani Lake	Tonalea	Tuba City
# Occupied	4,153	504	399	303	226	264	397	119	654	1,287
# In FBFA	1,796	460	399	303	107	25	4	58	185	255
# Out	2,357	44	0	0	119	239	393	61	469	1,032
% In	43%	91%	100%	100%	47%	9%	1%	49%	28%	20%
% Out	57%	9%	0%	0%	53%	91%	99%	51%	72%	80%

**Source: WHP 2008*

Updated census information was used to create the following graphs and tables (see Tables13–16 and Figures 10–11). The information used to make the tables was only available by Chapter. The information provided did not break down the number of houses within the FBFA Boundary, specifically. There are currently 6,420 housing units in all nine (9) chapters affected by the FBFA and of those total housing units, 5,372 houses are currently occupied. That is approximately 83.68% of the total housing within the FBFA (US Census 2010) (see Table 13).

Table 13: Housing Occupancy Numbers in the Former Bennett Freeze Area

Chapters	All	Bodaway-Gap	Cameron	Coalmine Canyon	Coppermine	Kaibeto	Leupp	Tolani Lake	Tonalea	Tuba City
Total housing units	6,420	650	420	264	231	576	537	285	762	2,695
Occupied housing units	5,372	474	326	190	181	465	450	202	651	2,433
Vacant housing units	1,048	176	94	74	50	111	87	83	111	262
For rent	49	0	0	1	0	21	0	0	4	23
Rented, not occupied	19	0	0	1	0	2	3	1	0	12
For sale only	3	1	0	0	0	0	2	0	0	0
Sold, not occupied	3	0	0	0	0	0	1	0	1	1
For seasonal, recreational, or occasional use	454	108	43	33	25	41	52	10	45	97
All other vacant	520	67	51	39	25	47	29	72	61	129

**Source: United States Census Bureau 2010*

Table 14: Housing Occupancy Percentage in the Former Bennett Freeze Area

Chapters	All	Bodaway-Gap	Cameron	Coalmine Canyon	Coppermine	Kaibeto	Leupp	Tolani Lake	Tonalea	Tuba City
Total housing units	6,420	650	420	264	231	576	537	285	762	2,695
Occupied housing units	83.68%	72.90%	77.60%	72.00%	78.40%	80.70%	83.80%	70.90%	85.40%	90.30%
Vacant housing units	16.32%	27.10%	22.40%	28.00%	21.60%	19.30%	16.20%	29.10%	14.60%	9.70%
For rent	0.76%	0.00%	0.00%	0.40%	0.00%	3.60%	0.00%	0.00%	0.50%	0.90%
Rented, not occupied	0.30%	0.00%	0.00%	0.40%	0.00%	0.30%	0.60%	0.40%	0.00%	0.40%
For sale only	0.05%	0.20%	0.00%	0.00%	0.00%	0.00%	0.40%	0.00%	0.00%	0.00%
Sold, not occupied	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.20%	0.00%	0.10%	0.00%
For seasonal, recreational, or occasional use	7.07%	16.60%	10.20%	12.50%	10.80%	7.10%	9.70%	3.50%	5.90%	3.60%
All other vacant	8.10%	10.30%	12.10%	14.80%	10.80%	8.20%	5.40%	25.30%	8.00%	4.80%
Homeowner vacancy rate (percent)	0.08%	0.20%	0.00%	0.00%	0.00%	0.00%	0.50%	0.00%	0.00%	0.00%
Rental vacancy rate (percent)	2.88%	0.00%	0.00%	4.30%	0.00%	13.00%	0.00%	0.00%	6.30%	2.30%

**Source: United States Census Bureau, 2010*

2.5.3 Demographic Trends

The Navajo Nation Demographic Trends

In the year 2010, the total population of the Navajo Nation was 173,667 people. The population on the Navajo Nation has decreased overall. In the year 2000, the total population of the Navajo Nation was 180,462 people. This was a decrease of three point eight percent (3.8%) in the population since the year 2000 (US Census 2010). There were 49,946 households on the Navajo Nation with an average household size of 3.5 persons and an average family size of 4.1 persons (United States Census Bureau, 2010).

2.5.4 Chapter Level Demographic Trends

Chapter-level population data dates back to 1980. For six of the nine chapters affected by the Bennett Freeze, population rose steadily between 1980 and 2000. Coalmine Canyon, Coppermine, and Tolani Lake, all lost population between 1980 and 1990 and then showed modest growth in 2000. (WHP 2008a) Tuba City, Tonalea and Leupp saw modest growth between the years 2000 and 2010. Tolani Lake, Kaibeto, Coppermine, Cameron and Bodaway/Gap saw a slight decline in population between the years 2000 and 2010. Coalmine Canyon saw a large increase in population between the years 2000 and 2010. This can be seen in the table shown below. Figure 16 depicts the population growth and decline from 1980 through 2010 in the nine (9) chapters affected by the FBFA. Figure 16 depicts the population fluctuation in all nine (9) chapters between the years 1980 through 2010.

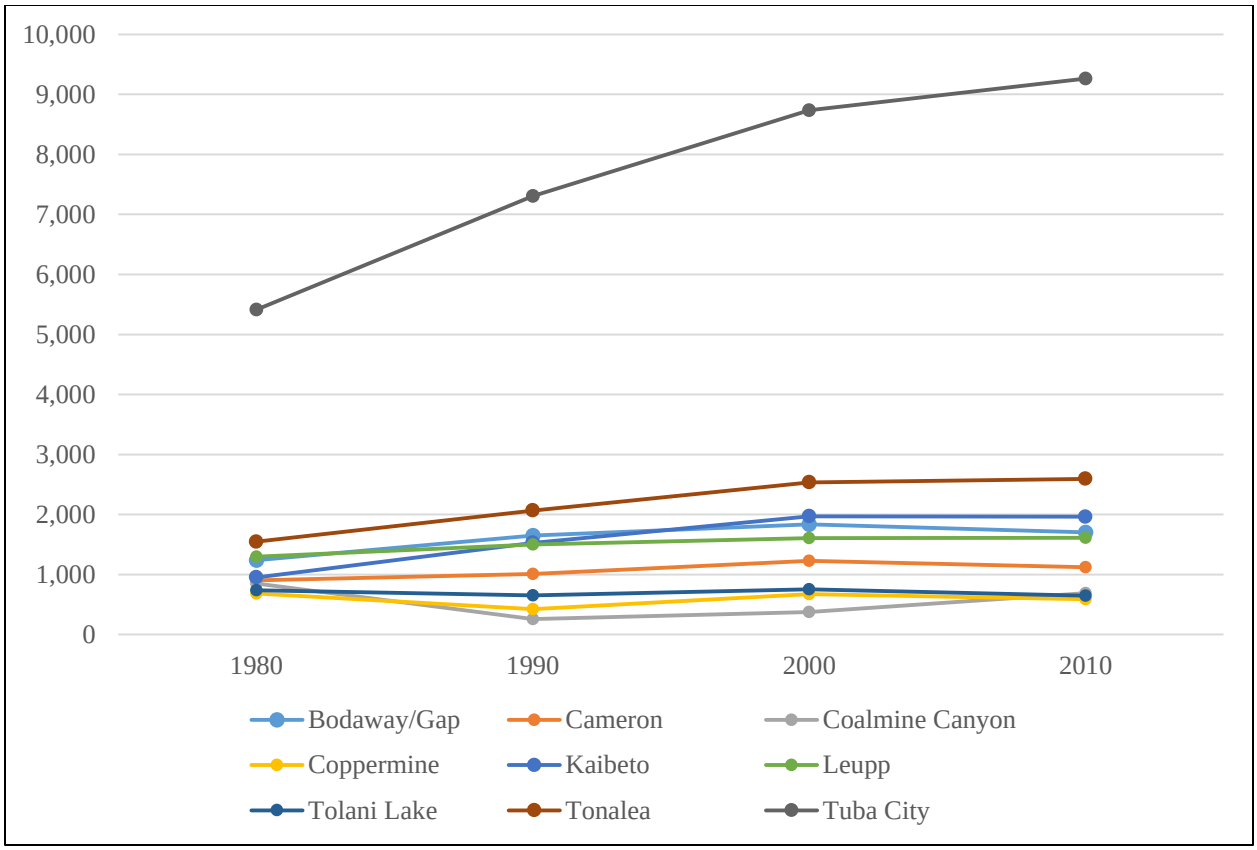


Figure 16: Former Bennett Freeze Area Chapter Population, 1980-2010
**Source: WHP 2008a, United States Census Bureau, 2010.*

Table 15: Population growth by decade measured from 1980 to 2010 in the Former Bennett Freeze Area

Years	1980	1990	2000	2010
Bodaway/Gap	1,238	1,649	1,837	1,704
Cameron	901	1,011	1,231	1,122
Coalmine Canyon	852	256	374	691
Coppermine	684	423	673	590
Kaibeto	952	1,529	1,970	1,963
Leupp	1,298	1,503	1,605	1,611
Tolani Lake	739	651	755	647
Tonalea	1,548	2,066	2,537	2,595
Tuba City	5,416	7,305	8,736	9,265
Total-All Chapters	13,628	16,393	19,718	20,188
Navajo Nation Total	132,052	148,983	180,462	173,667

**Source: United States Census Bureau, 2010*

The population in the FBFA has fluctuated greatly in the past 10 years. In the FBFA Recovery Plan that was written in 2008, the population was that reported in the year 2000 for the United

States Census. Since the 2008 Recovery Plan, a more recent census has taken place and this census took place in 2010. In the figure below, the graph shows the population from the year 2000 for the Chapters affected by the FBFA in comparison to the most current information from 2010. In the majority of the chapters, the population declined from the year 2000. In the graph below, the percent changes for the chapters affected by the FBFA are shown. Based on this figure, the biggest growth was seen in Coalmine Canyon Chapter with an increase in population of eighty four point eight percent (84.8%) and the Tuba City Chapter saw an increase in population by six point one percent (6.1%). There was also smaller growth in the Tonalea Chapter with an increase in population with two point three percent (2.3%) and the Leupp Chapter with zero point four percent (0.4%). Most of the chapters saw a decline in population from the year 2000 to the year 2010. Bodaway-Gap had a percent change of negative seven point two percent (−7.2%), Cameron had a percent change of negative eight point nine percent (−8.9%), Coppermine had a percent change of negative twelve point three percent (−12.3%), Kaibeto had a percent change of negative zero point four percent (−0.4%), and Tolani Lake Chapter had a percent change in population of negative fourteen point three percent (−14.3%).

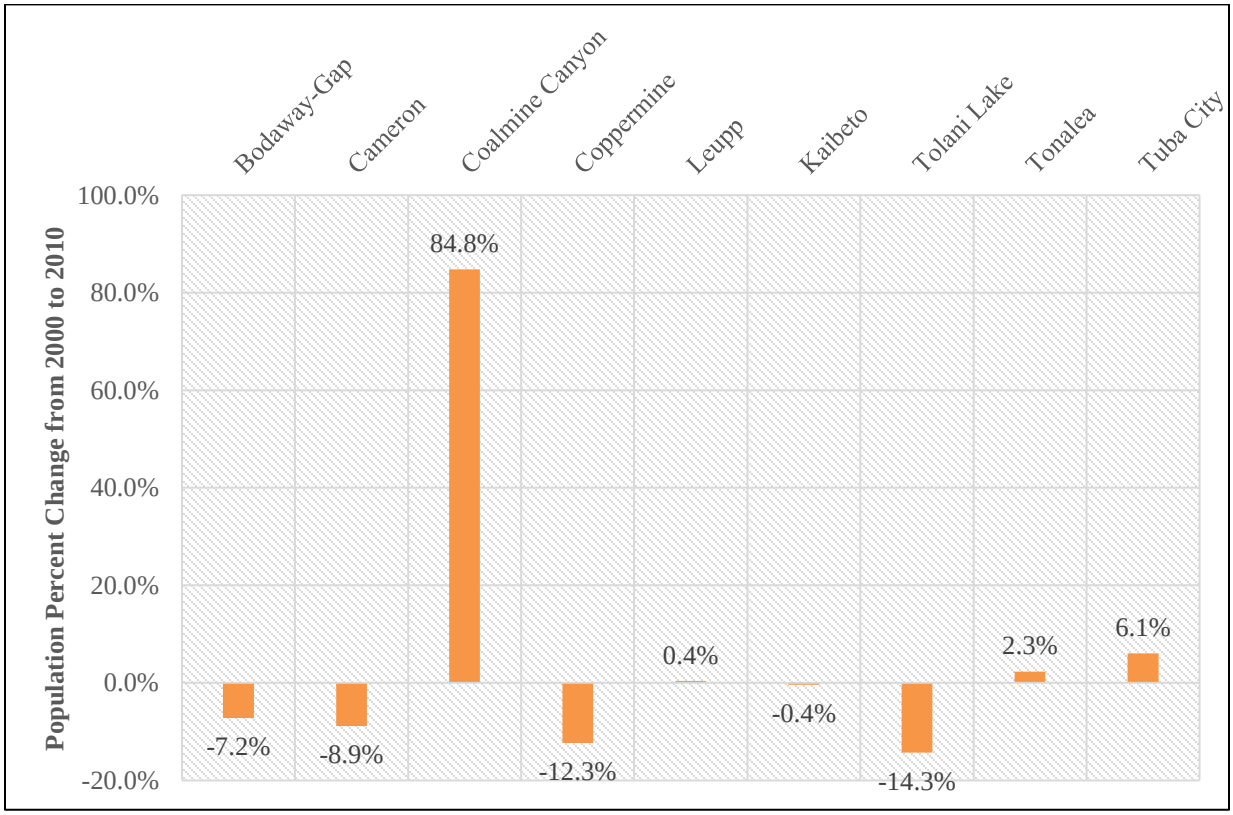


Figure 17: Population Percent Change from the Years 2000 to 2010 The average household size in the FBFA is 3.6 persons and the average family size is 4.2 persons (United States Census 2010). The number of households in the FBFA is 5,372 households.
*Source: United States Census Bureau, 2010.

Table 16 breaks down the number of households in the individual chapters located within the FBFA. Tuba City has the most households with 2,433 households and Coppermine has the least amount of households with 181 households (US Census 2010). The average household sized for the State of Arizona is about 2.6 persons.

Table 16: Number of households on the Navajo Nation and the Chapters affected by the Former Bennett Freeze Area.

Chapter Affected	Number of Households
Bodaway-Gap	474
Cameron	326
Coalmine Canyon	190
Coppermine	181
Kaibeto	465
Leupp	450
Tolani Lake	202
Tonalea	651
Tuba City	2,433
Total households on the Navajo Nation	49,946
Total households in the FBFA	5,372

**Source: United States Census Bureau, 2010*

2.6 Resource Use Patterns

2.6.1 Hunting, Fishing, and Gathering

The Navajo Nation Fish and Wildlife Department (NNDFW) has established hunting units throughout the Nation. The FBFA is within big game hunting units 9 and 10. Deer hunting is permitted in these units using both bow and rifle. There is a week-long general elk hunt permitted in these units in November and a month long general elk hunt in February. Trophy deer and elk hunts are also permitted during certain weeks in the year. Mountain lion is hunted within the FBFA area from October through March.

Fishing occurs at Cow Springs Lake and the Little Colorado River within the FBFA. Cow Springs Lake is a Navajo Fishing Lake stocked and maintained by the NNDFW. This is a warm water reservoir about 240 acres, that supports catfish, bluegill, yellow perch and largemouth bass. It is located 30 miles northeast of Tuba City along U.S. Highway 160. The lake receives minimal fishing pressure due to its remoteness, so fishing tends to be good.

The western boundary of the Navajo Nation parallels the Colorado River from Glen Canyon Dam to the Little Colorado River. The exact boundary varies from high water line to canyon rim, and is in dispute.

Gathering within the FBFA is practiced for sacred and utilitarian purposes. Plant/herb (ch'il/azee') gathering areas are important for several reasons. Ceremonial or medicinal plants grow within specific areas which need protection from disturbance. Plants are used in various ceremonies in the form of an emetic (iiłkóóh) to heal a patient from an ailment. Some plants are used as offering paraphernalia (k'eet'áán) and others as hoops (tsibąąs). Various parts of some plants are used as tools. Wool dyes and weaving tools are created from various plants.

2.6.2 Mineral Extraction

2.6.2.1 Uranium Mining

Uranium mining on the Navajo Nation began in 1947 as a result of the atomic age and subsequent arms race of the Cold War. Radium was discovered by Marie and Pierre Curie in 1898. All uranium ores contained radium (Powell 1994, Chenoweth 2007). Carnotite is a uranium-vanadium, bright greenish-yellow mineral that occurs as crusts and flakes in sandstones, having high uranium content, making it an important uranium ore and radioactive mineral (Chenoweth 2007). Mining for radium on the Navajo Nation began as early as the 1920s when John F. Wade located carnotite-bearing outcrops in the Carrizo Mountains while working with local Navajos. Three leases were issued to mine carnotite ore for its radium content in the Carrizo Mountains from 1920 to 1923 until high grade ore was brought into the market from the Belgian Congo, which ended the radium period in the U.S. in 1925 (Chenoweth 2007). Vanadium was subsequently extracted from the tailings of the radium mines from 1925 to 1947 because it was found to increase its tensile strength and elasticity when added to molten steel, which aided U.S. defense during World War II (Hahne 1990).

Uranium was originally considered a waste product of vanadium mines, but came into demand as a key element for developing nuclear weapons during the atomic age and the race for arms during the Cold War. During the development of an atom bomb, the Manhattan Project began a program to extract uranium from the radium and vanadium mill tailings on the Colorado Plateau around the beginning of World War II, and geologists were sent out to explore the region in search of new uranium sources. When World War II came to an end, uranium was still in high demand in order to ensure the continued development of atomic energy. Therefore, the Atomic Energy Commission (AEC) was established by the Atomic Energy Act of 1946, and the government constructed many roads into the backcountry and offered high dollar bonuses to geologists who could discover new sources for high grade ore (Powell 1994, Brugge and Goble 2002). As a result, the Four Corners area was filled with prospectors, who concentrated on exposed outcroppings along canyon rims, primarily searching for the Salt Wash Member of the Morrison Formation. Nearly 800 mines producing high grade ore were active on the Colorado Plateau by 1955.

Uranium mining nearly came to a standstill by 1967, but a brief second boom was triggered by private industries when nuclear power plants were constructed in the mid-70s. Domestic uranium

mining was virtually halted due to federal regulations, foreign competition and nuclear fears. High grade uranium was mined on or near the Navajo Nation until at least 1989 (McLemore and Chenoweth 1989).

The Bennet Freeze area is located within the western Abandoned Uranium Region (AUM), which is comprised of seven Chapters and encompasses approximately 4,028 square miles in the Painted Desert area of the Navajo Nation (Figure 18). Uranium was mined in this region between 1951 and 1963, and a total of 126 AUM-related polygons were identified in this region. There are approximately 74 AUM's located within the Bennet Freeze area. EMI developed revegetation plans and ecological site characterization for these AUM's (EMI 2015, Areas 8, 9 and 10).

The aftermath of previous mining activities within the Bodaway Gap Chapter have threatened the environmental quality of several areas, and there are 24 AUMs located throughout the southern portions. Radiation and heavy metals have been detected at five locations, seven have been identified as posing health risks, and the highest radiation readings have been detected at Highway 89 between the Junction and Hidden Springs.

2.6.3 Transportation Networks

2.6.3.1 Roads on the Navajo Nation

The roadway across the Navajo Nation consists of many different roads. In total, there are 14,221 miles of roads all across the Navajo Nation. Of these roads, approximately 6,000 miles are BIA roads, 1,644.8 miles are state highways, 1,689.8 miles are county routes, and 4,891.9 miles are owned and maintained by the Navajo Nation (Table 17). Within the FBFA, there are approximately 940 miles of roads and approximately 122 miles of those are paved (Development Needs of FBFA 1994).

Table 17: Road ownership by the amount of miles. Data from Navajo Department of Tranportation Long-Term Strategic Plan.

Agency Ownership	Total Amount Of Miles	% Of Total Road System
Bia	5,994.5	42.3%
Navajo Nation	4,889.9	34.5%
State	1,644.8	11.6%
County	1,638.4	11.6%
Total Miles on the Navajo Nation	14,167.6	-

Transportation on the Navajo Nation consists of a network of different roadways that vary in design from multi-lane highways to simple dirt roads (Navajo Nation Long Range Comprehensive Solid Waste Management Plan). The FBFA (FBFA) encompasses Nine (9) Chapters on the Western Agency of the Navajo Nation. There are many different roads within the FBFA and the following section highlights the major highways within the FBFA.

U.S. Highway 89 runs from north to south and runs in the middle of the FBFA. This highway begins in Flagstaff, AZ and eventually ends in Utah near Sevier, Utah. The highway goes directly through the Cameron Chapter, and the Bodaway/Gap Chapter. U.S. Highway 160 runs from east to west. This highway goes through Tuba City Chapter and Tonalea Chapter. U.S. Highway 160 starts near Tuba City, AZ and eventually ends in Colorado. State Highway 98 runs from north to south. This highway begins from U.S. Highway 160, north of the Tonalea Chapter. State Highway 98 runs through the Kaibeto Chapter and eventually ends near Page, AZ on U.S. Highway 89. State Highway 264 runs from east to west. This highway begins in Tuba City and continues through Arizona going east and eventually ends in Ya-Ta-Hey, NM. Coalmine Canyon Chapter is located right off of State Highway 264.

There are no major roads located near the Leupp and Tolani Lake Chapters. Leupp is located at the intersections of State Highway 99 and Indian Route 15. State Highway 99 started at Exit 245 on I-40 in Arizona and goes north. State Highway 99 ends at Indian Route 15 in Leupp, AZ. The Leupp-Oraibi Road is used to get to the intersection of the Leupp Oraibi Road and Indian Route 24. Indian Route 24 is the main road to get to Tolani Lake. The Leupp-Oraibi Road begins near Leupp, AZ and ends near Kykotsmovi Village north of Tolani Lake.

2.6.3.2 Airports

The Navajo Nation airport system is made up of 33 airports and airstrips. They are located in Arizona, New Mexico, and Utah.

Out of the 33 airstrips and airports, the Federal Aviation Administration Airport/Facility Directory (A/FD) currently lists 6 of those airports and airstrips (Navajo Nation Airport System Master Plan 2015). The airports and airstrips are: Chinle Municipal Airport, Kayenta Airport, Window Rock Airport, Shiprock Airstrip, Crownpoint Airport, and the Tuba City Airport. There is currently one airport within the FBFA. This airport is the Tuba City Airport, in Tuba City, AZ (Navajo Nation Airport System Master Plan 2015).

The vision for airports on the Navajo Nation is: “A safe, accessible, and environmentally responsible airport system that enriches sustainability, self-sufficiency and respects our prestigious Navajo Nation culture benefiting future Dine’ generations” (NNDOT 2015).

The overall goal for airports on the Navajo Nation is: to “Develop and improve the system of airports over time in such a manner that each community’s desires are achieved” (NNDOT 2015).

Objectives:

1) Prioritize needs and phase development to be in alignment with available funding and operational sustainability.
2) Actively seek funding from federal, state, and non-traditional sources.

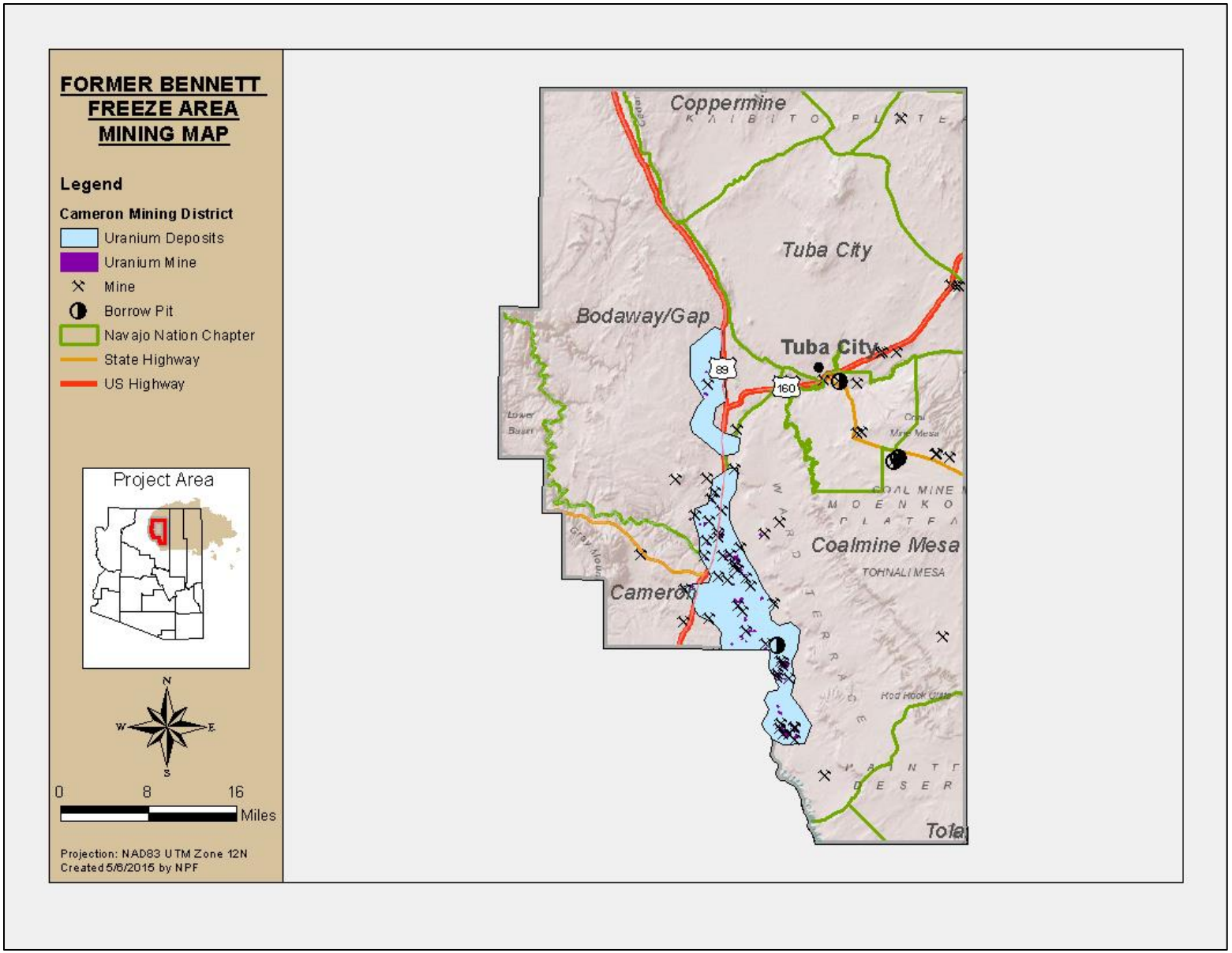


Figure 18: Mining locations within the Former Bennett Freeze Area.

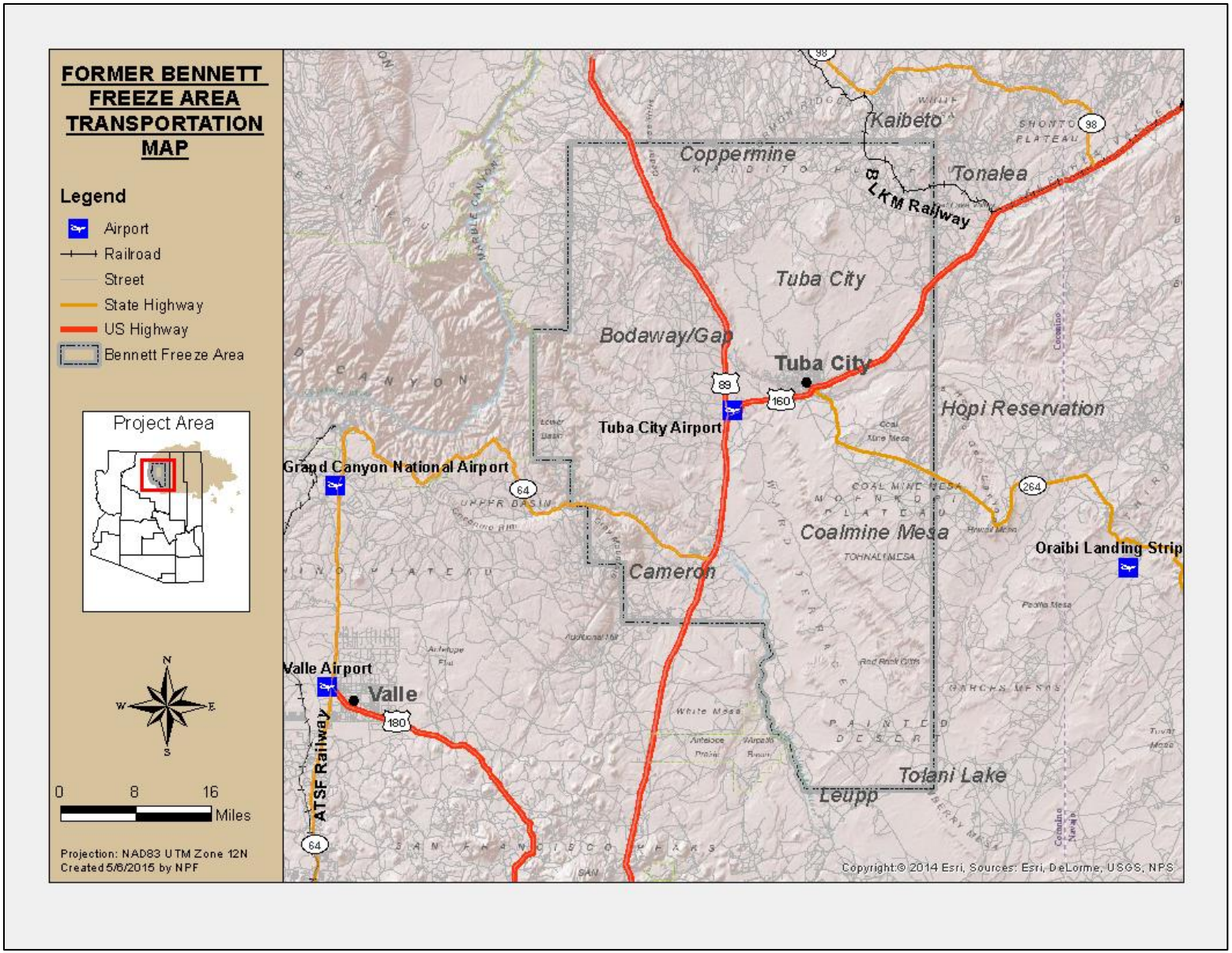


Figure 19: Paved Roads within the Former Bennett Freeze Area.

2.6.4 Public Health and Safety

The Navajo Nation Police (formerly known as the Navajo Tribal Police) is the tribal law enforcement. It is under the Navajo Division of Public Safety and is headed by a Chief of Police, six Police Captains and eight Police Lieutenants. It includes: Internal Affairs, Patrol, K-9 Unit, Dive Team, Tactical Operations Team, Traffic Unit, Fiscal management, Recruitment, and Training Divisions. The Navajo Nation Police are responsible for seven districts, Chinle, Crownpoint, Dilkon, Kayenta, Shiprock, Tuba City, and Window Rock. There are also several substations in each district ranging from one man substations or up to five officers each. Currently there are 210 police officers, 45 criminal investigators, and 279 civilians, acting as support staff for the department. There are an approximate 1.9 police officers per 1,000 people and one officer is responsible for patrolling 70 square miles (180 km^2) of reservation land.

The Navajo Nation Department of Fire & Rescue Services was established in 1985 in Fort Defiance and was initially charged with the responsibility of preventing and suppressing fires and performing some vehicle rescue (extrication) services. Today, the department is charged with preventing and suppressing fires, performing technical rescues, and mitigating the effects of hazardous material incidents. Other duties grand-fathered in, because of the evolution of the fire service, include emergency medical pre-hospital care delivery and the response to Weapons of Mass Destruction.

Services are provided from the following stations. Other communities not listed are either protected by a community fire department or the Bureau of Indian Affairs (BIA); Window Rock (Fire Station 10), Fort Defiance (Fire Station 12), Chinle (Fire Station 50), Tuba City (Fire Station 40), Leupp (Fire Station 80). At each fire station there are between 10–15 volunteer firefighters and one to two paid firefighters. The Fire Captain oversees sections of the department. Those sections include the Operations Section and the Prevention Section. The Fire Chief oversees the whole department.

The department responds to over 1,500 calls annually. In the six fire stations, property loss due to fires is estimated at over $1,000,000. Although fires account for a low percentage of calls (vehicle crashes are number one, followed by EMS calls), a single fire incident can result in over $50,000.00 worth of damages and losses.

2.6.5 Climate Change

Global warming and climate variability are likely to result in changes to the climate (e.g., temperature; precipitation timing, duration, intensity, and frequency), to the hydrology (e.g., snowmelt timing; streamflow), and to the ecosystems (e.g., species geographic distributions and population sizes) of the Navajo Nation (Nania et al. 2014). Much of the Navajo Nation economy and lifestyle are based on traditional practices such as livestock grazing (e.g., sheep, cattle, goats) and craft-making (e.g., weaving, jewelry production, artistry) (Nania et al. 2014) all of which are likely to be impacted by climatic changes.

Across the southwestern United States temperatures have increased on average 2°F within the last century and the 2001 to 2010 decade was the hottest on record (Melillo et al. 2014). The Navajo Nation is located within the hottest and driest region of the United States and across this region of the arid west, temperatures have increased on average 1.6°F. Temperature data indicate that since 1995, the Navajo Nation has consistently experienced annual average temperatures warmer than the long-term average of 1905–2011 (Crimmins et al. 2013).

The SW U.S. including the Navajo Nation has experienced a measurable drought from 1905 to 2011. Moreover, the period from 1994 to 2009 was the longest drought measured during the 20th century (Crimmins et al. 2013). Historically, winter precipitation was primarily snow and has transitioned to predominately rainfall during the winter season. Overall, a long-term decrease in both regional winter precipitation and regional annual precipitation has been observed starting in the 1930s (Redsteer et al. 2014). Warmer temperatures can influence evapotranspiration rates which can further reduce combined with a reduction in annual precipitation has led to an overall decrease in available surface water features. Elders from the Navajo Nation report a significant loss of surface water including springs and other water features. More than 30% of historical perennial water features on the reservation have disappeared or are ephemeral (Redsteer et al. 2014). Decreasing surface water availability translates to a decrease in water available for cities, agriculture, and ecosystems across the entire Navajo Nation and drought and increased warming foster wildfires and increased competition for scarce water resources for people and ecosystems (Melillo et al. 2014).

Average annual temperatures are anticipated to rise an additional 3.5°F–9.5°F by the end of the 21st century with the greatest temperature increases expected during the summer and fall seasons (Melillo et al. 2014). Climate projections for the mid- to late-21st century show a warmer climate with less annual precipitation across the entire SW region of the United States. Temperature projections modeled with a low-emissions scenario (conservative estimate of change) indicate that temperatures will rise 1–3°F during 2021–2050 period. Temperature projections modeled with a high-emissions scenario (substantial estimate of change) do not differ significantly from the predictions with low-emissions scenario until 2070 where model predictions indicate a 5–9°F during 2070–2099 (Crimmins et al. 2013). Model projections show that temperature increases are anticipated to be greater in summer and least in winter seasons. The same simulations also indicate increases, by a minimum of 17 days, in the length of the annual freeze-free growing season by mid-21st century (Crimmins et al. 2013, Melillo et al. 2014, Nania et al. 2014).

Climate Change Goals

Climate variability and change present both challenges and opportunities for the FBFA resource management. Goals are:

- To understand how climate variability and change affect present resource management strategies, and

- To integrate approaches to manage these impacts into near-term operational and long-term strategic planning

2.6.6 Hazardous Materials

The Arizona Department of Environmental Quality (AZDEQ) keeps a record of all Underground Storage Tanks (USTs) and Leaking Underground Storage Tanks (LUSTs) in the State of Arizona. They also keep a record of USTs and LUSTs on the Navajo Reservation (Figure 20). Using the AZDEQ Database, a search was conducted using the eMaps function on their website. This function allows the user to find USTs and LUSTs anywhere in the State of Arizona. Using this function, 5 (five) USTs were located within the FBFA (FBFA) in two different Chapters on the Navajo Nation. These two Chapters are Tuba City and Cameron.

There are four underground storage tanks located in the Tuba City Chapter. Two of the tanks are located approximately 150 feet west of U.S. Highway 160, which runs from North to South through the city of Tuba City, AZ. The tanks are located between two streets known as Bashas Drive and Peshlakai Drive. One tank is currently open and the other tank is currently open and active (Arizona Department of Environmental Quality). There are no known leaks or releases at either of these locations. The two other tanks which are also located in Tuba City, are located right off of a street named Main Street. Main Street runs west of U.S. Highway 160. The two storage tanks are located approximately 75 feet from Main Street and are located almost adjacent to each other. The two tanks are located between two streets called Navajo Blvd. and Maloney Street. One tank is currently closed and active. The other tank has been removed and there are no known releases (Arizona Department of Environmental Quality).

There is one underground storage tank located near the Chapter named Cameron. This storage tank is located approximately 400 feet south of the intersection of U.S. Highway 89 and State Highway 64. The underground storage tank is located right off of U.S. Highway 89, approximately 75 feet east of U.S. Highway 89. This tank is currently open and active. There are no known releases for this tank (Arizona Department of Environmental Quality).

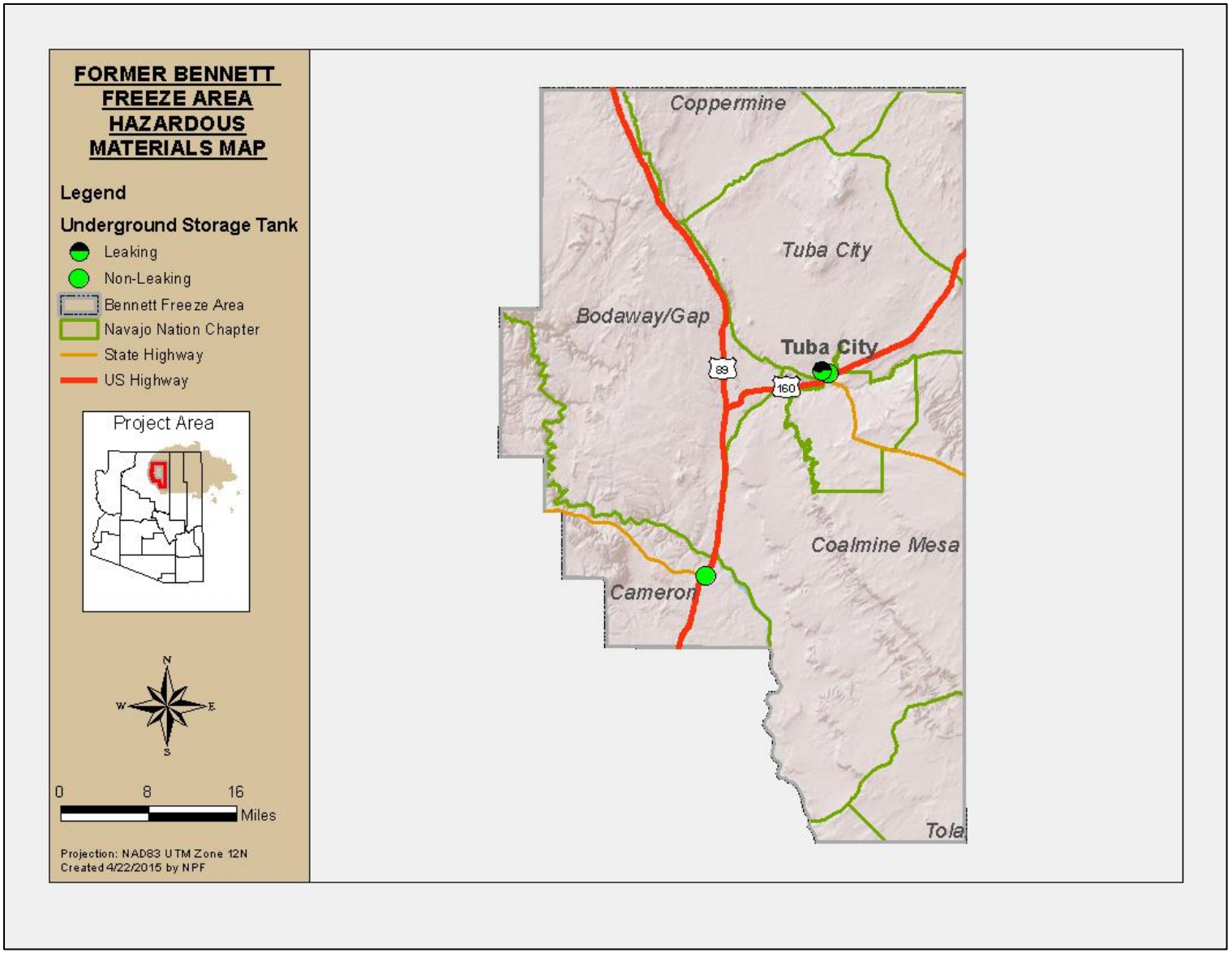


Figure 20: Known Hazardous Materials within the Former Bennett Freeze Area.

2.7 Community Land Use Planning

2.7.1 Bodaway Gap Chapter

This Chapter includes the communities of Navajo Springs, Bitter Springs, Cedar Ridge, the Gap, Hidden Springs, and the Junction. It is bordered by Cameron Chapter to the south, Coalmine Canyon Chapter to the southeast, and Tuba City and Coppermine Chapters to the east.

The following communities within the Chapter were affected by the former Bennett Freeze: Cedar Ridge, the Gap, Hidden Springs, the Junction (U.S. Highway 89 and U.S. Highway 160), a section of the Little Colorado River Valley Gorge, and the residents along the Colorado River.

Bodaway Gap Chapter Physical Setting

Chapter terrain is composed of deep canyons, open desert, and towering red rock cliffs. Elevations in the Chapter vary between 3,000 feet at the Colorado River to 7,000 feet atop the Echo Cliffs. The Chapter is surrounded by several tourist attractions: Lake Powell, Grand Canyon National Park, and Wupatki-Sunset Crater National Monument. The area is characterized by high elevation desert scrub and juniper woodlands. Ephemeral washes cross the Chapter, the three largest being Tanner Wash, Moenkopi Wash, and Hamblin Wash.

Bodaway Gap Land Status

The Chapter is located within Navajo Nation Land Management District 3 and consists of six main communities, rangeland, and open space. The Chapter is comprised of trust land with no private holdings, although a portion of the San Juan Paiute Reservation is located within the Chapter boundary. The Chapter is experiencing land disputes within and at its border. According to the Navajo Nation Land Department, the Grand Canyon Enlargement Act identifies the eastern rim of the Grand Canyon as the eastern-most border of the National park. This constitutes the western border of both the Navajo Nation and the Chapter. The Chapter boundaries overlap with the Cameron Chapter near the Little Colorado River. The process for addressing inter-chapter land overlap is handled by the Natural Resources Committee of the Navajo Nation, and appeals are heard in the Navajo Nation's District Court and Supreme Court.

Bodaway Gap Land Use

Approximately 95 percent of the Chapter's land is used for grazing cattle and sheep. Bodaway Gap is located within Grazing District 3 and Sub-Unit 3 and managed under Navajo Grazing Regulations (CFR 25, part 167) and by BIA Regional Director for the Shiprock, Fort Defiance, Chinle, and Tuba City Agencies and the Superintendent for the Crownpoint Agency. Ranger stations to patrol grazing land within the Chapter are located at a distance of at least 190 miles away, in Chinle and Shiprock.

The lack of ranger stations within the Chapter has resulted in insufficient range enforcement. There is also a lack of range preservation programs and public education in the FBFA of which this Chapter is within 84 percent. The lack of an adopted range management plan has resulted in deteriorating conditions. Overgrazing has caused increased soil erosion and inadequate

vegetation for livestock. Most grazing areas are not clearly identified or fenced. This has resulted in loose cattle that damage cultural sites, invade homesites, and cause irreversible damage to environmentally and culturally sensitive areas such as steep slopes, riparian corridors, and Areas of Avoidance (AOA). AOA consist of traditionally and culturally sensitive areas set aside to be protected from development in perpetuity to preserve their historic significance or ongoing ceremonial use. These are discussed further in the Bodaway Gap Chapter Cultural and Traditional Resources sections. Areas of development, actions (projects), and project phases for the Chapter were also identified in the same study. Planning process, projects, and project phases for this Chapter are expanded on in the Bodaway Gap Chapter Community Needs Assessment section.

Bodaway Gap Population and Housing

The 2010 US Census lists the Chapter population as 1,704 individuals. The Chapter has six communities where most tribal members reside. Other tribal members live in scattered homesites or clustered housing throughout the Chapter. The majority of homes are owner-occupied, but there are a considerable number of vacant homes. The Chapter's owner-occupancy rate is lower than the Navajo Nation's and Arizona's largely due to residents maintaining seasonal homes for recreational and livestock activities. The majority of homes (81%) in the Chapter are single detached homes.

Most of the residences are located along Highway 89, where water and electrical lines provide service. Residences located outside the main communities or away from Highway 89 are not served by utilities. According to field data conducted by WHPacific, Inc. (2008), 73% of homes in the Chapter are in poor to very poor condition, and 6 percent are in good to very good condition.

Bodaway Gap Government and Utility Infrastructure

The existing Chapter House is inadequate and needs renovation or reconstruction. The existing post office is too small for the current population. There is also a need for a veteran's center, an improved and expanded senior center, an animal shelter, and additional churches within the Chapter.

Empowering local governance within the Chapter was identified as a priority in the 2008 community workshops. The Chapter does not currently have the personnel or adequate facilities to support sufficient local government. An empowered local government will provide well-written proposals and can take on looming challenges positively. A dedicated committee can be created to follow through on needed projects and plans.

The Chapter desires to hire Chapter members to staff new Chapter government positions. In order to begin hiring for these positions, these chapters need to develop job descriptions for both a Community Services Coordinator and all other Chapter positions. Ongoing training in

leadership, financial management, public financial management, public service, and project management will build community development and local governance at the Chapter level.

The availability of utilities is very limited throughout most of the Chapter. Water, sewer, and electricity are available along parts of Highway 89. In most cases, residents not located adjacent to the highway do not have basic utilities. The WHPacific 2008 field survey indicated that over 40 percent of the residential structures were without electric power.

Existing services are provided by a variety of programs: Navajo Tribal Utility Authority (NTUA) provides water and sewer service, and Frontier Communications, formerly Navajo Communications Company, provides limited telephone service. All Chapter members use aboveground propane tanks for their natural gas needs.

Bodaway Gap Environmental Safety Status

The after effects of previous mining activities have threatened the environmental quality of several areas within the Chapter. There are 24 abandoned uranium mines located throughout the southern portions of the Chapter. Water quality associated with these abandoned uranium mines have put the Chapter at considerable health risk due to detectible levels of heavy metals and radiation (WHP 2008b).

Heavy metals and radiation have been detected at five locations. Areas with higher than normal radiation are located at Highway 89 between the Junction and Hidden Springs (WHPacific 2008). Seven areas have been identified as posing a health risk to tribal members. Oh De Koinsh Spring and Tanner Wash windmill were identified as having “some risk” to human health due to heavy metals and radiation (WHP 2008b). Toh De Koinsh Spring is two miles north of Bitter Springs while Tanner Wash windmill is two miles south of the community of The Gap. The Chapter would like to be part of a regional strategic plan to remedy environmental health hazards. This study will include an inventory of uranium contamination sites throughout the Chapter and a plan to restore environmental harmony.

Bodaway Gap Water

Legislation

All water resources within the Navajo Nation are under the jurisdiction of the Navajo Nation Water Code. These are subject to the water management practices of the Navajo Nation, and legislation has been created by the Navajo Nation to protect the water resources. This includes the Navajo Nation Clean Water Act, Water Quality Standards, and the Discharge Elimination System. Additionally, the Navajo Water Code prohibits any development within a half-mile of a well or windmill (WHP 2008b).

Surface Water

Surface water sources within the Chapter consist of the Colorado River, Little Colorado River, Tanner Wash, Hamblin Wash, Moenkopi Wash, several reservoirs, ephemeral washes, and several springs located along Echo Cliffs.

Ground Water

The Bodaway Gap Chapter groundwater is derived from aquifers, and Chapter wells tap into the C-aquifer. This aquifer has a total storage capacity of approximately 413 million acre-feet and recharges from outcrops on the Defiance Plateau, the Mogollon Rim, and the San Francisco Mountains (WHP 2008b). The low population density requires only about three percent of the total groundwater to be withdrawn in Arizona from aquifers located in this province (WHP 2008b). However, Navajo Nation Water Resources states that groundwater storage greatly exceeds the annual demand but that only a small fraction of the total groundwater in storage capacity can be readily developed. Generally, this is due to the water quality varying within the aquifer structure. For example, the deeper portions of the groundwater basin have water that is too high in saline for use by humans or livestock (WHP 2008b). The Bodaway Gap Chapter water quality, due to the abandoned uranium mines, has shown detectible levels of heavy metals and radiation (WHP 2008b).

Wetlands and Floodplains

Historical surface water flow data is not available for most of FBFA, nor are flood plain maps. There are some recorded wetlands in the Chapter mainly in association with riverine areas and fresh water ponds (USFWS 2016). Flood plain boundaries have not been determined by federal, state, or tribal entities. An inquiry with the Federal Emergency Management Agency in 2016 revealed that the Flood Insurance Rate Map (FIRM) for the unincorporated areas surrounding Bitter Springs, Arizona, dated September 3, 2010, showed that there is a small area in which the base zone flooding has been determined for the 100-year flood and assigned Flood Zone AE (FEMA 2016). Flood Zone AE includes areas subject to inundation by the 1-percent-annual-chance flood event. The majority of the Chapter is assigned to Flood Zone X, areas determined to be outside 500-year floodplain.

Water Rights

Water rights from the Colorado River have been tied up in litigation for many years. Tribal members feel they should have access to the Colorado River, based on historical use.

Chapter Water Needs

The Chapter wants to develop a water conservation educational program and build a waterline that delivers water to the Chapter from above Echo Cliffs. The Soil and Water Conservation Service, the Chapter's Grazing Official, and the Water Development Office have initiated a community educational program to address these needs.

The lack of groundwater prohibits windmill development, and existing earthen stock tanks have dried up due to the drought. Tribal members have had to haul water for both personal use and livestock. Tribal members have adapted to the shortage of water by traveling to the Gap to collect water at a community well.

Bodaway Gap Agricultural Resources

Legislation

The Navajo Department of Agriculture (NNDA) is established under the Division of National Resources within the Executive Branch of the Navajo Nation. It is tasked as the lead agency in planning, coordination, and management of all programs, policies and regulatory provisions designed to protect and preserve Navajo rangelands, livestock and agricultural resources.

NNDA provides administrative, guidance and support services to District Grazing Committees, Farm Boards and Eastern Land Boards Members, with emphasis on regulatory oversight in accordance to the specified provisions of Title III of the Navajo Nation Code.

Community Farmers

Bodaway Gap residents consider traditional, community farming of crops such as corn, squash, and beans very important to their way of life. Most of the agriculture that occurs within this Chapter, and the majority of the Navajo Nation, is defined by small family farms sized between 0.1–9.0 acres (US Census of Ag 2014). According to the US 2000 Census, 12 percent of Chapter residents are involved in agriculture or mining (WHP 2008b).

In order to perpetuate the type of farming traditional to the Navajo, Chapter members would like to cultivate small farms to produce food for Chapter members. This type of community-based agriculture would help preserve the way of life for Chapter members, stimulate commerce within the Chapter, and enhance the sustainability of the community.

Bodaway Gap Soils

One of the most impressive soil features in the Chapter is the Painted Desert. It is located in the southern portion of the Chapter and is generally found west of Highway 89, east of the Grand Canyon, and south of Big Canyon.

The Natural Resource Conservation Service (NRCS) is in the process if conducting a soils inventory of the Chapter. Each soil unit identified has characteristics that can be used to determine the development potential of the Chapter. While several soil unit maps have been created as part of the inventory, they are incomplete and the data is subject to revision.

Land Suitability sites for development were identified in the CLUP 2008, and the Chapter should continue to consult with the NRCS as Chapter soil profiles are completed in regards to suitable development sites within the FBFA.

Bodaway Gap Biological Resources

Legislation

Vegetation and wildlife resources fall under protection of the Navajo Nation Department of Fish and Wildlife (NNDFW) within the Division of Natural Resources. The Resources Committee has oversight responsibility of the Department. The Resources Committee developed Biological Resources Land Clearance Policies and Procedures to follow prior to development to ensure compliance with federal and Navajo Nation laws protecting plant and animal species along with their habitat.

The Policies and Procedures include the maintenance of a database with maps that classify the lands of the Navajo Nation into six Wildlife Areas based on the number and type of sensitive biological resources known to be located in that area. Development restrictions apply within each Wildlife Area based on the sensitive resources in that area. Guidelines for each Wildlife Areas need biological assessments requirements prior to development have been set in place. Table 18 presents the Wildlife Areas, their description, the development potential, and initial level of effort needed for project biological resource compliance fulfillment.

Threatened and Endangered Species

Several federal laws are designed to protect vegetation and wildlife resources within the Navajo Reservation. These laws include the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), the Eagle Protection Act, and the Migratory Bird Treaty Act (MBTA).

The federal government mandates the protection of endangered species found in the Colorado River and included in the Bodaway Gap Chapter. These species include the humpback chub, razorback sucker, Colorado pikeminnow (formerly known as the Colorado squawfish), and the bonytail chub. Projects governed under NEPA must have a biological survey conducted prior to project implementation with the exceptions of areas and projects listed in Table 18.

Wildlife Areas

Bodaway Gap Wildlife Areas have been identified and preliminary biological resource appropriate-development plans have been suggested for several areas within the Chapter. The Chapter's western boundary is assigned a Wildlife Area 5 designation- biological preserve. There are several high sensitivity areas located throughout the Chapter, several low sensitivity areas, and no community development areas as yet identified by NNDFW. Figure 21 presents a map of the Bodaway Gap Chapter Wildlife Areas. This map is included in the Bodaway Gap Chapter Land Use Plan (WHP 2008b).

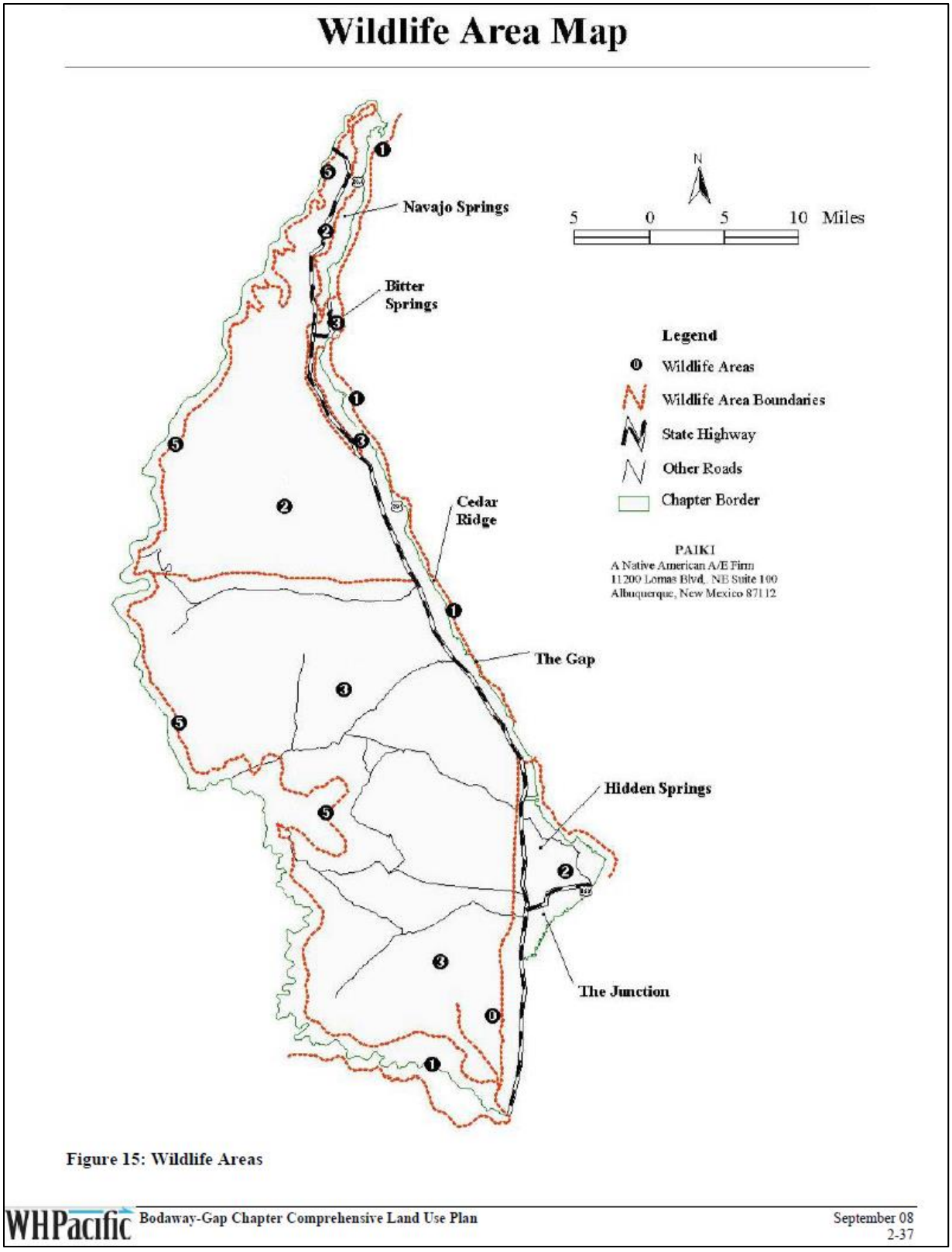


Figure 21: Wildlife Areas in Bodaway/Gap Chapter as published in WHP 2008b Bodaway/Gap Community Land Use Plan.

Table 18: Wildlife Areas in Bodaway/Gap as published in the WHP 2008b Bodaway/Gap Community Land Use Plan

Wildlife Area Designation	Biological Resource Sensitivity Level	Development Potential	Biological Assessment Required
1	Highly Sensitive	Little to None	Yes
2	Moderately Sensitive	Possible with buffering and location restrictions.	Yes
3	Low Sensitivity	Possible small-scale, individual development (homesites and utilities).	Depends on Development Type: No for individual, small scale development. Yes for any other kind.
4	Community Development	Good	Required only if proposed development could have significant impacts outside the community or if a certain species is known to exist in the community.
5	Biological Preserve	Limited. Any development within Area 5 must be compatible with the purpose of the management plan for the Area, if available.	Yes
6	Recreational	Limited. These Areas are used for recreation and include fishing lakes, camping and picnicking areas, and hiking trails	Yes

Bodaway Gap Mineral Resources

Legislation

The Minerals Department, under the Division of Natural Resources, is the center for all minerals and exploration/development projects on the Navajo Nation. The Minerals Department is charged with ensuring the proper management and accountability of Navajo Nation mineral resources and the Department is also responsible for the reclamation of lands that are disturbed by mining activities.

Minerals

Uranium is known to exist within the Chapter as evidenced by the 24 abandoned mines. Coal has been mined in the past based on place names within the Chapter such as Coalmine Canyon. The Chapter has no plans for mineral resource development and prefers to focus on mitigation and clean-up from past mineral extraction (WHP 2008b).

Bodaway Gap Cultural and Traditional Resources

Legislation

Navajo Nation Heritage and Historic Preservation Department is the lead agency for cultural resources preservation, protection and management planning on the Navajo Nation. It operates under the authority of the Navajo Nation Cultural Resources Protection Act [NN Code Title 19, §1001 (Chapter 8)].

The role of the NNHHPD is similar to that of a State Historic Preservation Office (SHPO). On behalf of the Navajo Nation, NNHHPD acts as the Tribal Historic Preservation Office (THPO) in the federal "Section 106" review process. NNHHPD advises federal, state/tribal agencies and project sponsors on protection and management of cultural resources in a manner that reflects the unique preservation concerns of the Navajo Nation.

Cultural Resources

The NNHHPD has inventoried and mapped the locations of several archeological sites and previous project locations, but the entire chapter has not been inventoried. NNHHPD does not reveal the locations of sensitive cultural sites due to the potential for vandalism, robbery, and the need to protect privacy. Hence the specific locations of cultural sites are not identified on maps.

Bodaway Gap Chapter has identified numerous sites where traditional cultural properties are found. In particular, the Colorado River, Marble Canyon, Echo Cliffs, Salt Canyon, Tanner Wash, and Shinumo Altar all have significant meaning to Navajo culture and traditions.

The Chapter has also identified AOA, as previously discussed in the Bodaway Gap Land Use section. The Navajo's traditional subsistence lifestyle includes using the land to gather a variety of plants/herbs for medicinal and ceremonial purposes and materials for arts and crafts. The areas that provide these resources are considered "areas of avoidance"–traditionally and culturally sensitive areas to be protected from development in perpetuity to preserve their historic significance or ongoing ceremonial use.

Bodaway Gap Chapter Community Needs Assessment

The community needs assessment is based on information provided from the community workshops in 2008 that were hosted by WHPacific, Inc., comments provided by the community, and professional field assessments completed by WHPacific, Inc. in the summer of 2008 (WHP 2008b).

The community needs assessment includes Chapter Vision and Goals for the FBFA, resource needs, identification of specific actions and projects that need to be implemented in the FBFA, project phases by timeline, and preferred development sites within the Chapter.

Bodaway Gap Vision

In the long-term, Chapter members want to maximize the benefits of modern opportunities, but at the same time maintain the integrity of traditional Navajo culture. Chapter residents want to preserve their rural atmosphere, but bring in modern amenities such as telephones, electricity, and plumbing to all residents who desire them.

Bodaway Gap Goals

During the community workshops held during summer 2008, community members outlined goals for the Chapter that will aid in reaching this vision. These goals include community policies, capital projects, and community service.

Community facilities and service are an important part of the community vision. The Chapter wishes to improve education, including expanding educational facilities for the Chapter's youth. A multi-purpose community center will provide a place for community members to congregate for recreational activities or community meetings. A community store will provide jobs and basic necessities for Chapter members and tourists. The Chapter wishes to hire staff to provide additional chapter services and provide ongoing planning efforts in an expanded office space with updated office equipment.

Infrastructure within the community will be improved, particularly within the FBFA, to provide water and electricity to all residents. Solid waste will be collected safely and reliably at a Chapter transfer station. Improved cellular communications infrastructure will improve quality of life and safety for all residents.

Because of the high cost of providing municipal infrastructure to remote houses in the Chapter, solar power with wind-powered back-up generators will be used to provide electricity to scattered rural homes. Rural homes will also have improved access to safe drinking water sources if the cost of connecting them to municipal services is too high. The Chapter will provide educational and training opportunities for residents and entrepreneurs to learn how to maintain these off-the-grid utilities.

Community facilities like a multipurpose center, schools, and an adult education center will provide computers and Internet access to support the curiosity, learning, and communication needs of all residents.

Bodaway Gap Resource Needs

Community Resource Needs were identified and divided into the following areas;

- Infrastructure/Utility
- Transportation
- Housing

- Health and Public Safety
- Community Facilities
- Economic Development
- Education
- Open Space, AOA, and Grazing

Bodaway Gap Chapter Priority Capital Improvement Projects

These needs are fully outlined in the 2008 Bodaway Gap CLUP. Once these resource needs were identified, the Chapter voted on which actions/projects should be addressed first through a vote. The top five projects the residents would like to see occur first consists of eight projects due to a three-way tie for the fifth project. The top projects include improved cellular phone and wireless service through the construction of communication towers, new scattered-housing sites that suit the traditional ranching lifestyle, construction of new skate parks for Hidden Springs, Bitter Springs, and Cedar Ridge, a sub-station for the Police Department in Gap, a 100-bed nursing home to serve Coppermine, Bitter Springs & Gap, young family housing, and a health clinic with a twenty-four hour ER/Trauma Department.

Proposed Infrastructure Projects

The Chapter would like to make sure that whenever additional infrastructure or infrastructure improvements are being considered, a feasibility study will be conducted. In addition to a feasibility study, the project should be included in the current year's Capital Improvements Plan for consideration. No infrastructure projects should be developed until they have been approved and are listed in a fiscal year within the Capital Improvements Plan. All infrastructure projects should be coordinated with Tribal and Federal infrastructure plans. Public Facilities should be based on approved facilities within the CLUP. Additional Public Facilities shall require an amendment to the CLUP.

Bodaway Gap Chapter Priority Project Phasing

This section outlines the phasing of the projects that received the most individual votes from Chapter residents at the community workshops. Phase 1 would be constructed in five years or less, Phase 2 would be constructed in 5-10 years, and Phase 3 projects would not be complete for another 10-15 years.

Phase 1 Projects: 1-5 Years

The following represent the projects identified as part of Phase 1 Developments by the voting groups. These are considered the items most urgently needed by Chapter residents:

- Senior citizens center
- Major Chapter House renovation or new building

- Shopping Center at the intersection of Highways 89A and 89 that includes tire repair services, a gas station, and a pay phone
- Commercial Development - Junction 89/160 (100 acres): Truck Stop & shopping center including fast food, clothing store, groceries and services, bank, fast food - water & infrastructure, engineering, master plan
- Truck stop w/car wash, auto repair & parts (Jct. for Tuba City)
- Agricultural storage/warehouse storage (Cedar Ridge)
- Truck stop w/car wash (Bitter Springs)
- New grocery store and post office (Bitter Springs)
- Community livestock auction yard (Cedar Ridge)
- Feed store
- Earthen dams repair (West side ridge)
- Facility to sell wool
- Daycare (Gap)
- Health clinic - 24 hour ER/Trauma (in planning near school)
- Hospital with long-term care (in planning stage w/clinic)
- Wellness center - fitness equipment, instructors & swimming pool - ties in with special diabetes program
- Facility for CHR program combined w/special diabetes program service providers, adult home caregivers - i.e., Resource office for programs
- Dental office (in planning near school on top of hill)
- Scattered houses
- Young family housing
- Home improvement/renovations and additions
- Housing subdivision - 25 units (Hidden Spring)
- Elderly rehab for accessibility - bathrooms & ramps
- Special needs independent living housing
- Town houses
- 6" or 8" water pipeline (Colorado R. & Glen Canyon Dam to Gap – Bitter Springs, Hwy 160/Hwy 89)
- Wastewater lagoon - commercial development (Cedar Ridge - old trading post site)
- Cellular One or Alltel Cellular Phone Tower
- Waterline (Cedar Ridge)
- Waterline (Pillow Hill)
- Waterline (10 miles S.W. of Tooth Rock)
- Waterline (Tooth Rock)
- Water and power (Shimuno Mesa - aka Dzil Li chii)
- Phone Lines
- Waterline (Twin Hill)
- Power line (Pillow Hill)
- Wastewater lagoon (by new medical center)
- Internet - wireless

- Feasibility study for wastewater lagoon - houses and industrial development (Hidden Springs & Cedar Ridge)
- Power line (Twin Hill)
- Waterline (Sam Willie)
- Wastewater lagoons (Hidden Springs)
- Landfill (Jct. Tuba City)
- Expand existing waste transfer station
- New small waste transfer station (Bitter Springs)
- Veterans cemetery
- Cemetery
- Multi-purpose community center (Bitter Springs)
- Multi-purpose community center (Cedar Ridge)
- Police sub-station (Gap)
- Police & fire station (to serve all 5 communities)
- Home base for police and rangers
- Caution lights at the Trading Post
- Fire station (in ea. Community)
- Street addressing
- Crosswalk to store/Trading Post
- School bus turnout
- Signage - school bus safety
- E.R. safety turnoff for runaway trucks (Cedar Ridge)
- Center Median/Turn Lane (curve at Cedar Ridge)
- Fire hydrants
- Detention center (Gap) - nearest to Tuba City
- New road (Cedar Ridge to Red Mesa)
- Repair and pave road (Hidden Springs to Tuba City/Moenavi)
- ADOT maintenance yard for Winter snow removal (1/2 way to Page/Cedar Ridge)
- Grade existing roads
- Pave road (Red Mesa to Bitter Springs)
- Widen Hwy 89 to 4 lanes
- New road (IR 20 to US-89 straight S.)

Phase 2 Projects: 5-10 Years

These are projects that realistically will take 5-10 years to get on the ground:

- Veteran's center (Echo Cliff)
- Updated Laundromat (Gap)
- Small business and training center
- Ranch resort w/great view, horseback riding, summer jobs (W. side of Cedar Ridge overlooking Grand Canyon)
- New Community livestock corral (Gap)
- Rehabilitate Community Livestock Corral (Bodaway, Hidden Springs, Bitter Springs, and Cedar Hill)

- Daycare (Bitter Springs)
- Daycare (Cedar Ridge)
- Nursing Home - 100 beds (to serve Coppermine, Bitter Springs, and Gap)
- Repair and pave road (Hidden Springs to Tuba City/Moenavi)
- Pasture improvement
- Community hay farm
- Moveable fencing for pasturing
- Permanent fencing
- Feasibility Study - Vocational/Community Development Training Programs - G.E.D., welding, carpentry, pipe fitter, leadership, nursing, house repair, agriculture, construction management, project management, personal finance, entrepreneurship, customer service, land & livestock management
- Staff housing for nursing homes – individual homes - 100
- Waterline for livestock & agriculture (Cedar Ridge, Twin Hill, Pillow Hill, Tooth Rock, and Sam Willie)
- Water pump (South side of the Colorado River)
- Youth/adult recreation center - basketball, showers, lockers
- Park near a recreational center - playground, benches, shade, grill, softball, basketball, and grass (Bitter Springs)
- Ambulance service
- N20 road paved and improved to Lechee
- Pave BIA Road Loop (Hidden Springs Rt. 6231 past Twin Hill, Pillow Hill & Sam Willie)
- Truck stop w/car wash (Gap)
- R.V. Park (Gap)
- Power line or solar power (10 mi. S.W. of Tooth Rock)
- Nearby watering point
- Irrigation project for agriculture (over the hill)
- Recycling Center
- Rodeo center and trail rides (Hidden Springs)
- Campground & R.V. Park (Lee's Ferry)
- Campground & R.V. Park (Navajo Springs)
- Trail rides - horseback riding for tourists
- Football field w/track for walking, running (near a Wellness Center)
- Shuttles for service 3x week (Page, Tuba City, and Flagstaff)
- Safe bike trail (along Hwy 89)

Phase 3 Projects: 10-15 Years

- R.V. Park (Bitter Springs or Cedar Ridge)
- Animal shelter (Gap or Bitter Springs)
- Women's shelter (Gap)
- Destination resort (Navajo Springs)
- Motel (Marble Canyon and Navajo Springs)

- Tourist/Arts &Crafts Center (Cedar Ridge)
- Casino (Cameron Jct. 64 Flagstaff)
- Wal-Mart (Coppermine)
- Computers & technology lab - higher education distance learning/satellite courses
- High School (Bitter Springs)
- Trailer park
- Power line (Tooth Rock)
- Skate parks near E.R. facility (Hidden Springs, Bitter Springs, & Cedar Ridge)
- Community livestock health care center (Gap)
- Post office expansion or relocation (top of hill)
- Build bank for a dam/bridge (Cameron over Little Colo. & Destination Resort)
- Tourist/Arts & Crafts Center (Navajo Springs)
- Adult & Youth Educational Center - Continuing Ed., Daycare, Dist. Ed., Communications Lab, Vocational/Community College (Cedar Ridge)
- Solar Power
- Wind power – (residential)
- Picnic ground (Cedar Ridge)
- K-8 Elementary & Mid School (Bitter Springs)

Preferred Development Sites

The Chapter identified its six community areas as ideal locations for future development: Navajo Springs, Bitter Springs, Cedar Ridge, Gap, Hidden Springs, and the Junction.

2.7.2 Cameron Chapter

This Chapter includes the community of Cameron. It is bordered by Bodaway Gap Chapter to the north and the Coalmine Canyon Chapter to the east. The western border of Cameron Chapter is the western border of the Navajo Nation. One hundred percent of the Chapter's 236,338 acres is within the FBFA. The entire Chapter was affected by the Freeze.

Cameron Chapter Physical Setting

The topography includes the wooded slopes of the Grey Mountain and the deep gorge of the Little Colorado River (WHP 2008c). The Chapter is also home to eroded plains, valleys, buttes, dry washes, and mesas of the Painted Desert (WHP 2008c). Chapter elevation varies between less than 2,800 feet above sea level to over 7,200 feet above sea level (WHP 2008c).

The Chapter is less than 40 miles away from the Grand Canyon National Park, which received 4.4 million visitors in 2007 (WHP 2008c). Visitors have the option to take a 57-mile scenic drive from Cameron to the Grand Canyon Village along Highway 64, following the Little Colorado River Gorge, and passing through the Little Colorado River Tribal Park (WHP 2008c). Chapter vendors offer arts and crafts for sale at two scenic overlooks along this route. Highway 89 runs north from Flagstaff through the Cameron Chapter. This route is a heavily traveled route that brings significant tourist traffic through the Chapter (WHP 2008c).

Cameron Chapter Land Status

The Chapter is located within Navajo Nation Land Management District 3 and consists of one community, rangeland, and open space. The Chapter is comprised of trust land with no private holdings. The Cameron CLUP does not contain any information regarding land disputes within its border.

Cameron Chapter Land Use

The majority of the Chapter's land is used for grazing cattle and sheep. Cameron is located within Grazing District 3 and Sub-Unit 3. Ranger stations to patrol grazing land within the Chapter are located at a distance of at least 155 miles away, in Chinle and Shiprock.

The lack of ranger stations within the Chapter has resulted in insufficient range enforcement. There is also a lack of range preservation programs and public education in the Chapter. The lack of an adopted range management plan has resulted in deteriorating conditions. Overgrazing has caused increased soil erosion and inadequate vegetation for livestock. Most grazing areas are not clearly identified or fenced. This has resulted in loose cattle that damage cultural sites, invade homesites, and cause irreversible damage to environmentally and culturally sensitive areas such as steep slopes, riparian corridors, and AOA.

Cameron Chapter Population and Housing

The 2010 US Census lists the Chapter population as 1,122 individuals. The Chapter has one community where most tribal members reside, Cameron. There is one residential subdivision and the remainder of homes are scattered in more remote areas. The Navajo Housing Authority

(NHA) has one subdivision of 25 housing units in Cameron. These homes are the only ones connected to a community sewer system (WHP 2008c).

The remaining houses are scattered homes built prior to 1970. The majority of homes are owner-occupied, but there are a considerable number of vacant homes. The Chapter's owner-occupancy rate is lower than the Navajo Nation's and Arizona's largely due to residents maintaining seasonal homes for recreational and livestock activities. The majority of homes (61 percent) in the Chapter are single detached homes (WHP 2008c). There is a higher than average number of mobile homes (27 percent) within the Chapter when compared to both Navajo Nation and Arizona (WHP 2008c).

Most of the residences are located along Highways 64 and 89 or near the junction of these highways, where water and electrical lines provide service. Residences located outside the Cameron community or away from Highway 89 are not served by utilities.

Many of the homes in the Chapter are of poor construction quality (WHP 2008c), and most of the homes within in the Chapter have been affected by the restrictions on improvements placed on the FBFA. This is based on the Chapter being located entirely within the FBFA.

Cameron Chapter Government and Utility Infrastructure

Empowering local governance within the Chapter was identified as a priority in the 2008 community workshops. The Chapter does not currently have the personnel or adequate facilities to support sufficient local government. An empowered local government will provide well-written proposals and can take on looming challenges positively. A dedicated committee can be created to follow through on needed projects and plans.

The Chapter desires to hire Chapter members to staff new Chapter government positions. In order to begin hiring for these positions, these chapters need to develop job descriptions for both a Community Services Coordinator and all other Chapter positions. Ongoing training in leadership, financial management, public financial management, public service, and project management will build community development and local governance at the Chapter level.

The availability of utilities is very limited throughout most of the Chapter. Water, sewer, and electricity are available along parts of Highway 89. In most cases, residents not located adjacent to the highway do not have basic utilities. The WHPacific 2008 field survey indicated that over 40 percent of the residential structures were without electric power.

Existing electric service is provided by Arizona Public Service (APS) and is crossed by two major electric transmission lines. The power lines are located approximately a mile from the U.S. Highway 89 and State Highway 64 corridors. The power lines distribute power from the electric grid in the Flagstaff and Holbrook area and are not connected to the major lines that meet at the Moenkopi switchyard. The major grid that traverses the Chapter, without a direct connection to

the Chapter, includes two 500-kilovolt (kV) electric power lines supplying power from the Navajo coal-fired generating station southbound to the Phoenix and southern California areas (WHP 2008c, pg. 2-48).

The APS electric distribution line that serves local needs carries power north from the Flagstaff and Holbrook areas to the Chapter. The Chapter currently has both three-phase power and single-phase power available along the U.S. Highway 89 and AZ Highway 64 corridors. All of the major power lines come together at the Moenkopi Switchyard, just northwest of the elementary school. The switchyard serves as an interconnection point where electric power may be switched, or redirected, to balance demands on the electric grid. Businesses require a higher voltage current connection, which is supplied by three-phase lines (the phases are known as A, B, and C phases, each with its own cycle and time). The main local power lines in the Chapter carry 69 kV and 12.5 kV current. Residents need a 120v and 240v electric current connection, which is supplied by single-phase power. At the Chapter's local electric substation, transformers reduce the incoming electric power and send it through local transmission lines as single- or three-phase power. The local APS electric power system will continue to expand its customer base. To do so, APS will work with Navajo Nation agencies to acquire the rights-of-way, land leases, and needed equipment. The Navajo Nation will work with APS to ensure future connections to the Chapter (WHP 2008c, pg. 2-48).

Natural gas is not available to the Chapter, and the majority of the Chapter residents use wood and coal for heating. Bottled propane is also available; however, it is imported from Flagstaff and Tuba City (WHP 2008c, pg. 2-51).

The Navajo Communications Company serves the telecommunication needs of the Navajo Nation. It provides landline telephone service, leases tower spaces to cellular companies, and offers cable television service. Cellular One and Verizon offer the best coverage for private cellular services on the Navajo Nation, although reception is often reported as unreliable and spotty (WHP 2008c, pg. 2-51).

Qwest Communications provides payphones at Cameron Trading Post. Improvements to the capacity of the landline system are planned along the major highways. Wireless communications require an initial investment in telecommunications towers by the wireless industry. Chapter members prefer wireless communication because the initial fees are less in comparison to landline service, which might require a line extension over a long distance (WHP 2008c, pg. 2-51).

Cameron Chapter Environmental Safety Status

Uranium ore was first discovered in the area at Ward Terrace in 1950. This led to construction of open pits along the Little Colorado River. Uranium was mined from these areas up to 1960. The uranium mines were abandoned and were reclaimed in 2000 (WHP 2008c, pg. 2-42).

Cameron Chapter Water

Surface Water

Chapter surface water is used for agriculture and livestock. When it rains, streams and washes are filled with water, which in turn fills watering holes. During times of drought, livestock has access to well water, either directly from the well or hauled to watering places.

The Chapter lies within the Little Colorado River Basin, which is part of the larger Colorado River water system. The Little Colorado River rises in eastern Arizona and in southeastern Apache County and flows northwest through a series of deep gorges directly underneath the Chapter's planning area. It joins the Colorado River in the Grand Canyon, approximately 70 miles north of Flagstaff. Moenkopi Wash, a smaller but significant tributary, covers the northeastern part of the Chapter and drains the northwestern escarpment of Black Mesa. Flow from this wash drains to the Little Colorado River. Numerous springs (mostly dry) dot the planning area (WHP 2008c, pg. 2-34).

There are at least 12 concentrated in the southern portion of the planning area. Other smaller tributaries of the Little Colorado River also drain the area: however, the water is lost by evaporation or infiltration before the flow reaches the Little Colorado River. Many of these tributaries are unnamed (WHP 2008c, pg. 2-34).

Ground Water

The Chapter is located along the edges of the Little Colorado River Basin where water-bearing rocks consist primarily of sandstone, limestone, and other conglomerates. Monoclines cross the area and provide structural control for the movement of groundwater along the regional gradient. The major water-bearing units are divided into two aquifers: the Coconino aquifer (C-aquifer) underlying the Little Colorado River Basin and the Limestone aquifer underneath the Coconino Plateau Basin (WHP 2008c, pg. 2-41).

The Coconino Sandstone

The C-aquifer system yields water of good chemical quality except southwest of Leupp and in the northern part of the Black Mesa basin where excessive amounts of dissolved solids could render it unfit for use. The C-aquifer includes the Coconino Sandstone, the De Chelly Sandstone, the Moenkopi Formation, and the Shinarump Member of the Chinle Formation. The Coconino Sandstone is of very fine to medium-grained, well-sorted quartz grains. The grains are coarse near the southern extend of the unit along the Mogollon Rim and grade into a finer grain size to the north. The De Chelly Sandstone is a thick-bedded fine- to medium-grained sandstone and hydraulically connected with the Coconino and the Shinarump Member of the Chinle Formation. The Chinle and Moenkopi Formations consist primarily of mudstone and siltstone beds. The Chinle Formation and the De Chelly and Coconino Sandstones are the primary sources of groundwater. The other members of Chinle Formation and the Moenkopi Formations are too

fine-grained and act as aquicludes. The C-aquifer system thins rapidly to the north and pinches out along the Utah-Arizona border (WHP 2008c, pg. 2-41).

The Limestone Aquifer

The Limestone aquifer consists of several hydraulically connected limestone, dolomite, sandstone, and shale units. Most of the water in the aquifer is derived from the downward migration of water from the overlying C-aquifer system. Shale units within the Limestone aquifer impede the downward migration of water, while solution cavities and fracture zones provide avenues for lateral movement. A large portion of the groundwater moves northward and discharges from springs along the Little Colorado and Colorado Rivers and Havasu Creek. The largest of these springs includes Blue Springs and Havasu Springs, which discharge 100,000 and 29,000 gallons per minute, respectively. Groundwater development in the basin is small and limited by the great depth to water of 3,000 feet and the low yield of only a few tens of gallons per minute (WHP 2008c, pg. 2-41).

Wetlands and Floodplains

Historical surface water flow data is not available for most of the FBFA, nor are flood plain maps. There are some recorded wetlands in the Chapter mainly in association with riverine and freshwater forested shrub areas along the Little Colorado River and fresh water ponds located south of the community of Cameron (USFWS 2016). Flood plain boundaries have not been determined by federal, state, or tribal entities. An inquiry with the Federal Emergency Management Agency in 2016 revealed that the Flood Insurance Rate Map (FIRM) for the unincorporated areas surrounding Cameron, Arizona, dated September 3, 2010, showed no flood prone areas (FEMA 2016).

Water Rights

Water rights from the Colorado River have been tied up in litigation for many years. Chapter residents feel they should have access to the Colorado River, based on historical use. The Chapter needs to look into acquiring water rights to the Colorado River and Little Colorado River in order to provide water to the community (WHP 2008c, pg. 3-6).

Chapter Water Needs

Improved water tanks at windmills are needed to better serve the water hauling stations. If water in these tanks will be used for human consumption, then water quality should be regularly monitored. Water storage tanks are needed for each house that is not connected to piped water (WHP 2008c, pg. 3-6). Drinking water is also needed within the Chapter, and new water well tapping into one of the aquifers is needed and included on one of the Chapter priority projects (WHP 2008c, pg. 3-11).

Cameron Agricultural Resources

Community Farmers

Cameron residents consider traditional, community farming of crops such as corn, squash, and beans very important to their way of life. Most of the agriculture that occurs within this Chapter, and the majority of the Navajo Nation, is defined by small family farms sized between 0.1–9.0 acres (US Census of Ag. 2014). According to the US 2000 Census, 10 percent of Chapter residents are involved in agriculture or mining (WHP 2008c).

In order to perpetuate the type of farming traditional to the Navajo, Chapter members would like to cultivate small farms to produce food for Chapter members. This type of community-based agriculture would help preserve the way of life for Chapter members, stimulate commerce within the Chapter, and enhance the sustainability of the community (WHP 2008c, pg. 3-10).

Cameron Soils

The Natural Resource Conservation Service (NRCS) has completed a soil inventory of the Chapter. There are twelve soil units throughout the Chapter, and they range from fine sand, sandy loam, and gravelly clay loam to cinders and bedrock (WHP 2008c, pg. 2-37).

Land Suitability sites for development were identified in the CLUP 2008, and the Chapter should continue to consider soil profiles in regards to suitable development sites within the FBFA.

Cameron Biological Resources

Threatened and Endangered Species and Resource Protection Zones

Portions of the Chapter contain some sections classified by the NNDFW as Resource Protection Zone 1, a highly sensitive wildlife resource area. The Little Colorado River is protected with a buffer zone from thick riparian vegetation that protects yellow-billed cuckoo and southwestern willow flycatcher. The eastern portion of the planning along Ward Terrace is designated as Resource Protection Zone 2. The remaining area within the Chapter is designated as Resource Protection Zone 3, which is considered a low-sensitivity area (WHP 2008c, pg. 2-39).

Cameron Mineral Resources

Minerals

Uranium is known to exist within the Chapter as evidenced by the abandoned mines that were reclaimed in 2000 (WHP 2008c, pg. 2-42). The Chapter has no plans for mineral resource development in the CLUP. However, the Chapter feels natural resources such as mineral deposits should also be used wisely to ensure sustainability (WHP 2008c, pg. 3-5).

Cameron Cultural and Traditional Resources

Cultural Resources

The NNHHPD has inventoried and mapped the locations of several archaeological sites and previous locations, but the entire chapter has not been inventoried. The NNHHPD does not reveal the locations of sensitive cultural sites due to the potential for vandalism, robbery, and the need to protect privacy. Hence the specific locations of cultural sites are not identified on maps.

Cameron Chapter has identified numerous sites where traditional cultural properties are found and all of them have significant meaning to Navajo culture and traditions. Any cultural sites within the Chapter should also be preserved (WHP 2008c, pg. 3-5).

The Chapter has also identified AOA, as previously discussed in the Cameron Land Use section. The Navajo's traditional subsistence lifestyle includes using the land to gather a variety of plants/herbs for medicinal and ceremonial purposes and materials for arts and crafts. The areas that provide these resources are considered "areas of avoidance" – traditionally and culturally sensitive areas to be protected from development in perpetuity to preserve their historic significance or ongoing ceremonial use.

Cameron Chapter Community Needs Assessment

The community needs assessment is based on information provided from the community workshops in 2008 that were hosted by WHPacific, Inc., comments provided by the community, and professional field assessments completed by WHPacific, Inc. in the summer of 2008 (WHP 2008c).

The community needs assessment includes Chapter Vision and Goals for the FBFA, resource needs, identification of specific actions and projects that need to be implemented in the FBFA, project phases by timeline, and preferred development sites within the Chapter.

Cameron Vision

In the long-term, Chapter members want to maximize the benefits of modern opportunities, but at the same time maintain the integrity of traditional Navajo culture. Chapter residents want to preserve their rural atmosphere, but bring in modern amenities such as telephones, electricity, and plumbing to all residents who desire them.

The Cameron Chapter would like to achieve this vision in the following way (WHP 2008c, pg. 3-1):

The Chapter should develop new and better housing and utilities, which will aid the establishment of economic development in designated corridors. The economic development will be implemented by working with economic development officials, utility providers, and others to further develop the selected sites for each land use improvement. Road and utility improvements

should take place throughout the Chapter, particularly by providing electric and water service to additional customers. Certain more remote roads should be paved or otherwise improved.

In addition, programs will be developed to bring commercial and industrial businesses to the community and to provide community facilities. Within several years, the new economic development will bring jobs that will be available to local residents. The economic development and community facilities areas will be designed and built in a manner that is compatible with the preservation of residential, range, agricultural, and open space areas.

Cameron Chapter Goals

Guiding Principles

With the development goals, in mind the Chapter has developed guiding principles that would apply to each development project (WHP 2008c, pg. 3-5). The Chapter would like to provide for people's basic needs, such as power and water. The Chapter needs to plan for improving the overall health of its members. Public safety and emergency medical service needs improvement to better respond to emergency situations (WHP 2008c, pg. 3-5).

Sustainable construction should be required for all new buildings. These buildings should be energy-efficient and designed to last many generations. Structures should be designed to work with the land in order to provide passive solar energy to further reduce energy costs, achieving the goal of Chapter self-sufficiency (WHP 2008c, pg. 3-5). These structures should provide optimal protection from the elements with high-quality insulation to better regulate indoor temperatures and raised floors to protect against flooding.

New developments should not harm the natural environment or negatively impact traditional ways of life. It is important to protect water quality and groundwater for future generations. Other natural resources such as mineral deposits should also be used wisely to ensure sustainability. Any cultural sites within the Chapter should also be preserved. New developments in the Chapter should incorporate community-supported agriculture to provide healthy local food to the community.

During the community workshops held during summer 2008, community members outlined goals for the Chapter that will aid in reaching this vision. These goals include community policies, capital projects, and community service (WHP 2008c, pg. 3-1).

Ranching and raising grazing animals is a rich and viable way of life in this Chapter. A nearby ranger station will help to more efficiently manage rangelands and prevent theft of livestock. Range management education programs will help preserve the quality of the land and maintain this means of subsistence (WHP 2008c, pg. 3-2).

All residents who wish to live in the Chapter will have safe, durable, energy-efficient homes with access to electricity and safe drinking water, whether they are located near the center of the

community or in remote areas. Residents will have a full range of housing options to support each stage of life and all financial circumstances. Chapter members will be able to live in scattered homesites if they are grazers who prefer to live a subsistence lifestyle, or clustered housing developments if they prefer the amenities and infrastructure of a modern community (WHP 2008c, pg. 3-2).

Mobile home parks and rental houses will be available for people who may need to move from the Chapter in the future or for people who are in immediate need of a home. Elderly living facilities will allow independence while also providing assistance with preparing food, social opportunities, and medical care (WHP 2008c, pg. 3-2).

The road system will be improved and maintained to be safe and efficient in all weather conditions and seasons. Infrastructure within the community will be improved, to provide water and electricity to all residents. Solid waste will be collected safely and reliably at a Chapter transfer station (WHP 2008c, pg. 3-2).

Improved cellular communications infrastructure will improve quality of life and safety for all residents. Nearby emergency health, fire, and police facilities and substations will provide a quick response to medical and safety emergencies. Helicopter service to Tuba City or Flagstaff will respond to major emergencies. All homes will be assigned addresses for emergency response and be within range of reliable cell phone service (WHP 2008c, pg. 3-2).

Community facilities and services are an important part of the community vision. The Chapter wishes to improve education, including educational facilities for the Chapter's youth. A multi-purpose community center will provide a place for community members to congregate for recreational activities or community meetings. A community store will provide jobs and basic necessities for Chapter members and tourists. The Chapter wishes to hire staff to provide additional Chapter services and provide ongoing planning efforts in an expanded office space with updated office equipment (WHP 2008c, pg. 3-2).

Economic development will improve quality of life for the Chapter and retail and recreational opportunities for tourists. Ranchers will have nearby water resources for livestock. Chapter vendors will be able to sell Navajo arts and jewelry to tourists. Renewable energy projects, including solar and wind projects, will create green-collar jobs. The Chapter will be able to provide all of its energy needs and export surplus energy for a profit. Investment in the service industry to cater to tourists will further diversify the local economy (WHP 2008c, pg. 3-2).

Cameron Chapter Obstacles

The Cameron Chapter has identified development obstacles and formulated possible solutions to surpass or avoid them. Some of the obstacles include lack of available land for development. There is not much land available for community development facilities or new homes due to the large number of grazing permits in the Chapter. The land withdrawal process to remove some of the grazing land to be used for development is a lengthy process that many grazing permit

holders may not support. This is due to lack of adequate compensation for the grazing land withdrawal and the absence of feasibility studies for economic development projects that could allow land to be withdrawn for projects that are not justifiable (WHP 2008c, pg. 3-3).

In order to surpass this development obstacle, the Chapter can identify lands suitable for future growth and develop a memorandum of understanding with land users about the future use of these lands. This would require that the Chapter bring governance to the local level by initiating and pursuing Local Governance Act (LGA) certification. The land withdrawal and approval process is a long, bureaucratic process. The Chapter could bring this process to a local chapter level and conduct its own business site lease agreements in order to speed up economic development projects and amend bylaws to promote Chapter flexibility. Under LGA certification, the Chapter can also promote equitable land use appraisal for compensation purposes for land withdrawn for development (WHP 2008c, pg. 3-4).

The Chapter feels the Navajo Nation central government is distant and inaccessible to the residents. The lack of a local government creates a feeling of powerlessness among community members. Resources from central government to build community and Chapter facilities is inaccessible, and conflicts between Navajo Nation chapters over chapter service areas and boundaries further restricts access to needed funding (WHP 2008c, pg. 3-4). This was identified as another obstacle to FBFA development.

Empowering local Chapter governance was identified as a solution to stagnant Chapter development. The Chapter needs to hire personnel to support local government. The Chapter desires to hire Chapter members to staff new Chapter government positions. In order to begin hiring for these positions, the Chapter needs to develop job descriptions for the Community Services Coordinator and all other Chapter positions. Ongoing training in leadership, financial management, public financial management, public service, and project management will build community development and local governance at the Chapter level (WHP 2008c, pg. 3-4).

Funding is another obstacle the Chapter recognized as in FBFA development. With limited federal money and lengthy bureaucratic processes to acquire it, the Chapter needs to seek money elsewhere to fund improvement projects. A grant writer on the Chapter payroll can help the Chapter receive better funding. Implementation of Native American Housing and Self Determination Act (NAHASDA) plans will help the Chapter gain funding from the U.S. Department of Housing and Urban Development (HUD). Generating local revenue through community-based projects will further help the Chapter gain more funding for projects (WHP 2008c, pg. 3-4). Based on the Chapter's proximity to an international tourist destination, a significant amount of generated local revenue could come from outside the Chapter.

Cameron Chapter Resource Needs

Community Resource Needs were identified and divided into the following areas;

- Infrastructure/Utility
- Transportation
- Housing
- Health and Public Safety
- Community Facilities
- Economic Development
- Education
- Open Space, AOA, and Grazing

Proposed Capital Improvement Projects

The Chapter needs to create economic development projects, and continual updates to the Chapter development plans are necessary to help Cameron residents decide which projects will be the most beneficial to the residents. The Chapter's CLUP should continue to be regularly updated with a Capital Improvements list that can be updated as projects are completed and new projects are envisioned (WHP 2008c, pg. 3-5).

Cameron Chapter Priority Capital Improvement Projects

These needs are fully outlined in the 2008 Cameron CLUP (WHP 2008c). Once these resource needs were identified, the Chapter voted on which actions/projects should be addressed first through a vote. The top five projects the residents would like to see occur first consists of nine projects due to several tied votes. The top projects include new scattered housing for Cameron Chapter residents, a new drinking well tapped into the aquifer, a water line extension in Ward Terrace and Black Falls, paving and improvement to existing roads, construction of a clinic/health center with dental, rehabilitation, cancer, pediatric and elder care, a power line extension for 15 homes in Gray Mountain and 47 homes in North Cameron Chapter, a new Chapter complex/one-stop shop multipurpose building with chapter offices, senior citizen center, business office, and office sites for lease, the construction of the Western Navajo water pipeline from Lake Powell to Cameron, and Public Service Complex with a police and fire station along with a jail (WHP 2008c, pg. 3-11).

The following ideas were added to the list of priority projects by the planning team and were not included in the previous list created during the community workshops (WHP 2008c, pg. 3-12).

- Fund water rights to Colorado River
- Command center for Emergency Response Team, drill teams, welcome committee
- Telephone landlines to all homes
- Veteran housing

Cameron Chapter Priority Project Phasing

This section outlines the phasing of the projects that received the most individual votes from Chapter residents at the community workshops. Phase 1 would be constructed in 5 years or less, Phase 2 would be constructed in 5-10 years, and Phase 3 projects would not be complete for another 10-15 years (WHP 2008c, pg. 3-12).

Phase 1 Projects: 1-5 Years

The following represent the projects identified as part of Phase 1 Developments by the voting groups. These are considered the items most urgently needed by Chapter residents (WHP 2008c, pg. 3-12):

- Water filtration system
- Daycare
- Recycling Center/Compressor
- Solid Waste System/pickup
- Youth Sports Complex/youth recreation park/ball fields
- Coconino/Diné College Extension Facility
- Propane Station
- Road Maintenance Facilities
- New Vendor Booths
- Wind Farm Development
- Animal Feed Store
- Funding to acquire water rights to Colorado River
- Replace windmills and earthen tanks
- Identify range areas and farms
- Health Clinic
- Veteran Center
- New Scattered Housing for FBFA Residents
- Passive-solar energy-efficient homes
- Remote satellite education
- Improve by paving existing roads/school bus route
- Bridge and culvert replacement
- Rural addressing system
- Community walkway trails
- Western Navajo water pipeline from lake Powell to Cameron
- All utilities hooked to housing
- Power line extension for homes in Gray Mountain and all homes in North Cameron chapter
- Water line extension in Ward Terrace and Black Falls
- Solid waste transfer station
- Water development and watering points
- Police/fire Station (Public Service Complex)

- Humane Society

Phase 2 Projects: 5-10 Years

These are projects that realistically will take 5-10 years to get on the ground (WHP 2008c, pg. 3-13):

- Early Head Start Program
- Farmers Market/Equipment Rental
- Women's Shelter
- Gravel/sand pit
- Pendleton Wool Industry
- Tourist Complex to include RV park, tourist shops, museum, visitor center, and support services
- Native Health food store
- Upgrade corrals used by community (branding, etc.)
- K-12 school facility
- Vocational, GED, tech. school
- Extended college education
- Shuttle to Flagstaff and Grand Canyon
- Community airport

Phase 3 Projects: 10-15 Years

The following represents the project identified by one small group as part of Phase 3 Developments. This project should be considered part of future efforts to expand economic development opportunities for local residents, including providing additional jobs and adding on to existing livestock management knowledge and expertise (WHP 2008c, pg. 3-13):

- Renewable energy institute

Preferred Development Sites

The Chapter identified several areas as ideal locations for future development (WHP 2008c, pg. 3-14):

Housing Development

Chapter choices as to where to locate and where not to locate concentrated land development have been consistent over time. The plan is for housing development to occur in the five-mile stretch of U.S. Highway 89 south of the Little Colorado River (with the Dzil Libei Elementary School at the southern end of that corridor, about three miles south of the U.S. Highway 89 and AZ Highway 64 intersection).

The Chapter House site is on the west side of U.S. 89, one-half mile south of the Little Colorado River Bridge. The site is described as five parcels totaling nearly 30 acres. Three existing parcels

comprising 16.5 acres include the Chapter House, the USFS modern hogan, the preschool, the current location of the log plant, and a building that might be able to be renovated for one of the community social and health services uses. Also, there are 13.5 acres of proposed additions to the land area (WHP 2008c, pg. 3-14).

The Chapter has made the decision to put both a health care clinic and a dental clinic on the "chapter tract." Other potential uses would be a senior citizens center and depositories to serve basic needs for hay and other commodities. There is an existing housing development to the south of this site. The location of the existing housing, however, is unlikely to be a suitable location for new residences because the soil is sand overlain with gravel (WHP 2008c, pg. 3-14).

Economic Development

Areas identified for economic development include the Highway 89 Business Corridor. This is the largest of the development sites and is centrally located within the planning area. To capitalize on its proximity to the U.S. Highway 89 and AZ Highway 64 intersection, the Chapter's plans consist of attractive commercial street fronts that offer a mix of commercial uses. These include retail, office space, lodging and restaurants, a park with a picnic area, a visitor center, and an art gallery. The commercial mix would be compatible with market demand, development practices (for example, the business site lease process), and land uses of the surrounding area (WHP 2008c, pg. 3-15).

Four specific areas within this Highway 89 Business Corridor are highlighted below (WHP 2008c, pg. 3-15).

Little Colorado River Business Park

Because this area has spectacular views of the Little Colorado River to the south and vast expanses beyond, the Chapter can capitalize on these beautiful gifts from nature and establish a business along the riverfront on either side of U.S. Highway 89. Such a business should feature the views from this site (WHP 2008c, pg. 3-15).

Western Diné Gateway Commerce Center

The development at the U.S. Highway 89 and AZ Highway 64 intersection should be characterized as a Highway Oriented General Commercial Development designed to facilitate pedestrian access and provide for good circulation of motorized traffic. Tourist amenities, as well as retail convenience and personal services, should make up this commercial center (WHP 2008c, pg. 3-15).

Halgai Tó Industrial Park

The development of an industrial site should be on land large enough to adequately support this type of development, including possible expansion. Businesses should typically consist of those requiring on-site storage of materials and offer structures for operations and direct access to trucking routes. Examples include warehousing, repair shops, wholesale distributors, and light

manufacturing. The proposed industrial site is located in the southern portion of the Chapter along U.S. Highway 89 (WHP 2008c, pg. 3-15).

Shadow Mountain Business Park

The proposed development of the U.S. Highway 89 business corridor is envisioned as a highway service area oriented towards the traveling public with the ability to also cater to the needs of area residents (gas stations, motels, restaurants, etc.).

Economic development is also planned for the Little Colorado River Gorge Development. This unique area consists of the narrow gorge of the Little Colorado. In many ways, this wonderful natural resource is as breathtaking as the Grand Canyon. In addition to preserving and maintaining it, the Chapter also wishes to capitalize on this resource through both tourism and commerce. Presently, two overlooks along the gorge have rest areas with picnic tables to provide leisure for tourists. Native vendors sell their handmade crafts at both overlooks. The Chapter intends to further develop each overlook. Small, fee-based walking trails, either guided or self-guided, can be established so that tourists can view this fantastic creation of nature (WHP 2008c, pg. 3-15).

First and Second Overlooks

Vendors are currently set up to sell their arts and crafts at this site. The future development plans are designed to provide attractive vendor spaces and to reinforce the site's commercial uses, unique identity and character, and educational or informational features. The parks development program should be compatible with the preservation of natural areas and the unique character of "vendor spaces" and prominent views (WHP 2008c, pg. 3-15).

East Gate Grand Canyon Development

Within this unique area, the community has a vision for business establishments that would accommodate and target the tourists entering and leaving the Grand Canyon National Park. These businesses would capitalize on its unique location where the Navajo Nation meets the Grand Canyon National Park. This location is at the western edge of the Chapter (WHP 2008c, pg. 3-16).

Economic development is also planned for the Dzil Lichii Sheep Camp. Within this unique area, the community has a vision for a Navajo bed and breakfast establishment. This business would capitalize on its unique location where the Little Colorado River flows into the Grand Canyon. This location is in a very sensitive wildlife zone; hence, the bed and breakfast would be designed to fit in with the natural environment without the basic amenities of electricity and running water (WHP 2008c, pg. 3-16).

Further economic development is also planned for the Tó Bee Hwíísgáni Development. Within this area, community members wish to develop a business park in addition to community facilities and housing. The community desires for this area to grow and prosper. The business venture could provide needed services to the people from the community, but also it could

provide services for tourists who travel through the area. Capturing this tourist traffic could also keep tourists in the Chapter's region longer where they may spend money at other facilities (WHP 2008c, pg. 3-16).

2.7.3 Coalmine Canyon Chapter

Also known as Leejin ha gid, the Coalmine Canyon Chapter is located in the southwestern part of the Navajo Nation. The Chapter is approximately 402,357 acres in size. Tolani Lake is to the southeast, and Leupp is to the south. One hundred percent of the Chapter's 402,357 acres is within the FBFA (WHP 2008d, pg. 1-3). The entire Chapter was affected by the Freeze.

The Freeze had a significant emotional and physical effect on this Chapter, because many Navajo people lived on lands partitioned to the Hopi Tribe within what was considered the Coalmine Mesa Chapter. Due to this legislation, most of the community relocated from Coalmine Mesa to Coalmine Canyon, New Lands, or elsewhere, although a few Navajo people remained in the Hopi Partitioned Land under a lease agreement with the Hopi Tribe. When the community moved the Chapter from Coalmine Mesa to Coalmine Canyon four miles to the east, the Chapter officially changed its name from Coalmine Mesa Chapter to the Coalmine Canyon Chapter. The move resulted in grazing permits with much less acreage as compared to their original acreage. Many Chapter residents had to sell off a number of livestock resulting in a shift away from livestock grazing, an important Navajo tradition (Navajo Times 2013).

Although the Chapter struggled at times, even holding Chapter meetings in random places such as the rodeo grounds, the community is striving to move forward. It has built a new chapter house where it now holds regular planning meetings. Indeed, additional success has been realized to some extent with the construction of a large residential development, the new chapter house, expanded electric lines, and waterline service to homes near the chapter house (WHP 2008d, pg. 1-5).

Coalmine Canyon Chapter Physical Setting

Coal Mine Canyon sits at the edge of the 120-mile wide Painted Desert, a sparsely settled region without many roads but covered by extensive areas of exposed, weathered rock. The Chapter House sits on the rim of Coalmine Canyon within the dramatic landscape view of San Francisco Peaks, Navajo Mountain, and the western rim of the Grand Canyon.

The Coalmine Canyon Chapter landscape consists of low, broad mesas, high plateaus and wide valleys with gently rolling desert grasslands, sand dunes, and hills (H. Sandoval 2002). Elevation within the land varies from a low of 4,700 feet above mean sea level (AMSL) on the Little Colorado River to a high of 6,000 feet AMSL near the Chapter House. Slopes range from 0-77 percent (WHP 2008d).

Lechii OiH, the areas around Ward Mesa, and the lands in the far northeast portion of the Chapter have some of the steepest slopes. The region between the Little Colorado River and Ward Mesa is flat, while the upper areas of the Chapter lands are punctuated by several terraces with steep cliffs (Coalmine Canyon CLUP 2-28).

The Chapter is less than 70 miles away from the Grand Canyon National Park, which received 4.4 million visitors in 2007 (WHP 2008d). Highway 89 runs north from Flagstaff through the

Coalmine Canyon Chapter. This route is a heavily traveled route that brings significant tourist traffic through the Chapter (WHP 2008d). Tourism in the Coalmine Canyon Chapter is a valuable resource the Chapter wishes to address in their development plans (WHP 2008d).

Coalmine Canyon Chapter Land Status

The Coalmine Canyon Chapter land status is trust land with no private holdings. The vast majority (95%) of the Coalmine Canyon Chapter was affected the Freeze even though 100% of the Chapter acreage is located within the FBFA. This is due to the Chapter's proximity to Tuba City, the administrative area for the Western Agency of the Navajo Nation. This small portion of the Chapter that crossed the Western Agency administrative area was exempted from the Freeze. The Chapter was reduced to five percent of the 1955 Chapter land area, and is based on its grazing district boundary (WHP 2008d, pg. 2-27).

Coalmine Canyon Chapter Land Use

The majority of the Chapter's land is used for grazing cattle and sheep. Coalmine Canyon is located within Grazing District 3 and Sub-Unit 5. Ranching and sheep herding have been a major occupation and a way of life in the Chapter for many years. These activities have strong connections to the customs and cultural heritage of Chapter residents. Many residents who graze livestock have homesites and family clusters located in remote areas of the Chapter (WHP 2008d, pg. 2-40).

Grazing District 3-1 is within the Tuba City Western Agency. According to BIA records, there were 165 grazing permittees in Grazing District 3-1 in 1940. Today, there are about 100 permittees (WHP 2008d, pg. 2-40).

The lack of an adopted range management plan has resulted in deteriorating conditions. Overgrazing has caused increased soil erosion and inadequate vegetation for livestock. Most grazing areas are not clearly identified or fenced. This has resulted in loose cattle that damage cultural sites, invade homesites, and cause irreversible damage to environmentally and culturally sensitive areas such as steep slopes, riparian corridors, and AOA.

Coalmine Canyon Chapter Population and Housing

The 2010 US Census lists the Chapter population as 691 individuals. The majority of homes are owner-occupied and are single detached homes (WHP 2008d, pg. 2-8). The majority of homes were built between 1980 and 1989; since that period home construction has slowed or stopped. The median year for a structure built in the Chapter is 1978 (WHP 2008d, pg. 2-9).

Two new subdivisions, an NHA subdivision and the Relocation homes, were completed in 2002. The southern and southeastern portion of the community tract is designated as single residential housing. It is in this area that the 60 new homes are situated (WHP 2008d, pg. 2-12).

Most of the residences are located in the Coalmine Canyon Chapter community tract which consists of 414 acres of tribally withdrawn land in the northwest corner of the Chapter located

along Highway 264 near the Chapter House (WHP 2008d, pg. 2-45). Many of the homes in the Chapter are of poor construction quality (WHP 2008j), and most of the homes within in the Chapter have been affected by the restrictions on improvements placed on the FBFA. According to field data conducted by WHPacific in 2008, 59 percent of homes in the Coalmine Canyon Chapter are in poor to very poor condition and 22 percent are in good to very good condition (WHP 2008d, pg. 2-10).

Coalmine Canyon Chapter Government and Utility Infrastructure

The Chapter House, built in 2004, serves as a local governance center for the community and houses the Public Employment Program (PEP) and the housing construction and renovation assistance program (WHP 2008d, pg. 2-15).

Several major electricity providers, including the Salt River Project (SRP), Arizona Public Service (APS), and the NTUA, own or operate transmission lines within the Chapter's planning area. Only the NTUA provides electricity to the Community tract and nearby residents located in the northeast portion of the planning area along Highway 264 (WHP 2008d, pg. 2-57).

In 2002 NTUA extended a three-phase line to the new Community. This line provides electricity to the new homes located in the Community tract as well as to the Chapter House and several homes outside the tract (WHP 2008d, pg. 2-57).

The Questar "Southern Trails" pipeline spans the northwestern portion of the planning area from Moenkopi to Cameron. ARCO constructed the pipeline in 1957 to move crude oil from the Four Comers area to California. In 1977, ARCO reversed the pipeline's direction and used it to transport oil from Southern California to the north. Questar purchased the pipeline in 2002, converted it to a natural gas pipeline, and activated only the portion west of the Colorado River. The pipeline is again flowing in the southwesterly direction, carrying natural gas from San Juan basin in the Four Comers area. Although several companies draw gas from Questar's pipeline, they do not provide service to the Chapter's planning area (WHP 2008d, pg. 2-59).

Communications include telephone, radio, television, Internet, and newspaper. Citizens Communications is the primary provider of telephone service in Kerley Valley. Growing coverage of the Navajo Nation by cellular telephone service has begun to replace the need for landline service in some cases, especially for personal communications; however, some businesses may require the stability of landlines. Improvements to the capacity of the landline system are called for in the proposed development areas. Continuing to improve telecommunications can build stronger business links that can help stimulate commercial development opportunities (WHP 2008d, pg. 2-59).

Presently, there are no solid waste disposal sites within the Chapter. An area has been designated for a solid waste transfer station within the community tract. The proposed area is fenced, but lacks the necessary facilities to operate a solid waste transfer station (WHP 2008d, pg. 2-59).

Limited areas of the Chapter are served by public water systems. Kerley Valley, the community tract, residents surrounding and near the community tract, and residents north of Cameron are the only areas served by public water systems. These water systems are owned and operated by the NTUA (WHP 2008d, pg. 2-53).

The Chapter community at Coalmine Canyon has IHS/NTUA-provided water for the subdivision and 12 homes nearby. The homes in the Kerley Valley access the Tuba City community water service. The homes located north of Cameron access an IHS/NTUA waterline serving homes north of the Little Colorado River. There are no individual wells (WHP 2008d, pg. 2-53).

Many families rely on individual wells for drinking water. Water hauling is common practice and can be difficult for some families, particularly the elderly, as it requires significant time and effort. The residents in the southwest part of the Chapter have been informed by Indian Health Services (IHS) that their well water has unsafe levels of uranium and should not be used as drinking water. Possible solutions to provide safe drinking water to the area include (1) a reverse osmosis process to purify the well water; (2) the extension of waterlines (the nearest point that waterlines now reach is Tolani Lake); and (3) hauling water on a regular schedule and in large quantities (WHP 2008d, pg. 2-53).

There are about 10 livestock windmills in the Chapter (WHP 2008d, pg. 2-53).

Coalmine Canyon Chapter Environmental Safety Status

Coal is found just north of the Chapter House, and a vein of coal less than 10 feet thick is exposed along the rim of Coalmine Canyon in the northern portion of the Chapter. Across Highway 264 is a nonfunctioning coal mine, about a mile north of the Chapter House. This mine operation was abandoned because of an extensive underground fire that smoldered for nearly 10 years, according to local residents. Evidence of the burn is still visible after 20 years of weathering (WHP 2008d, pg. 2-42).

From the 1940s through the 1970s, hundreds of uranium mines were opened throughout the Navajo Nation, including the western portion of the Chapter. Within the planning area, uranium ore was first discovered in Ward Terrace near Gold Springs in 1950 (WHP 2008d, pg. 2-42).

Uranium was mined from these areas until 1960. Abandoned for years, the pits were reclaimed by 2000. Sand and gravel also exist within the Chapter. There are at least two gravel borrow pits within the community. One such pit is located just east of the Chapter House, and the other is located along N 6731, eight miles southwest of Tuba City. Pumice and clay are other minerals found in the area, and they are located on the western part of the Chapter, near the Little Colorado River (WHP 2008d, pg. 2-42).

The residents in the southwest part of the Chapter have been informed by Indian Health Services (IHS) that their well water has unsafe levels of uranium and should not be used as drinking water (WHP 2008d, pg. 2-53).

The Chapter would like to have a study funded on effects of uranium mining will help the Chapter create a program for restitution for health effects. Existing uranium mines and test pits will be closed and remediated to prevent further contamination (WHP 2008d, pg. 3-2).

Coalmine Canyon Chapter Water

Surface Water

The Chapter lies primarily within two watersheds within the Little Colorado River basin, which is part of the larger Colorado River watershed basin. The area is drained to the west by the Little Colorado River. The Little Colorado River is a tributary of the Colorado River, approximately 315 miles long. It rises in eastern Arizona and in southeastern Apache County and flows northwest through a series of deep gorges past the southwestern portion of the Chapter. It joins the Colorado River in the Grand Canyon, approximately 70 miles north of Flagstaff. The Little Colorado River comes in from the Southeast and flows to the northwest, along the southwestern and western edge of the Chapter. A smaller but significant tributary, Moenkopi Wash, bounds the northern part of the Chapter and drains the northwestern escarpment of Black Mesa. The flow from this wash drains to the Little Colorado River (WHP 2008d, pg. 2-37).

Other smaller tributaries of the Little Colorado River also drain the area; however, the water is lost by evaporation or re-infiltrates before the flow reaches the Little Colorado River. Many of these tributaries are unnamed. (WHP 2008d, pg. 2-37).

Ground Water

The Chapter is located in the Little Colorado River Basin where water-bearing rocks consist primarily of sandstone, limestone, and other conglomerates. Several distinct aquifer systems underlie the Little Colorado River Basin. The main water source for the Chapter is the Navajo aquifer, which dominates the higher plateau region at the 6,000 ft. level. The Coconino aquifer is in the valley along Highway 89 near the Little Colorado River. An existing well within the Community tract brings water from the Dakota Aquifer (WHP 2008d, pg. 2-35).

The Coconino Sandstone

The C-aquifer system yields water of good chemical quality except southwest of Leupp and in the northern part of the Black Mesa basin where excessive amounts of dissolved solids could render it unfit for use. The C-aquifer includes the Coconino Sandstone, the De Chelly Sandstone, the Moenkopi Formation, and the Shinarump Member of the Chinle Formation. The Coconino Sandstone is of very fine to medium-grained, well-sorted quartz grains. The grains are coarse near the southern extend of the unit along the Mogollon Rim and grade into a finer grain size to the north. The De Chelly Sandstone is a thick-bedded fine- to medium-grained sandstone and

hydraulically connected with the Coconino and the Shinarump Member of the Chinle Formation. The Chinle and Moenkopi Formations consist primarily of mudstone and siltstone beds. The Chinle Formation and the De Chelly and Coconino Sandstones are the primary sources of groundwater. The other members of Chinle Formation and the Moenkopi Formations are too fine-grained and act as aquicludes. The C-aquifer system thins rapidly to the north and pinches out along the Utah-Arizona border (WHP 2008d, pg. 2-35).

The Navajo Aquifer

The quality of the water within this system is excellent. The Lukachukai member of the Wingate Sandstone, the Moenave Formation, the Kayenta Formation, and the Navajo Sandstone comprise what is referred to as the N-aquifer. The Lukachukai Member consists of a fine to very fine-grained quartz sandstone that is homogeneous throughout the region. The Moenave Formation consists of two sandstone members that include Dinosaur Canyon and the Springdale Members. These consist of coarse- to very-fine-grained quartz sandstone with a large percentage of silt and firm calcareous cement (WHP 2008d, pg. 2-35).

The Kayenta Formation consists of a sandstone facies and a silt facies; the form is bonded with calcareous cement. The Navajo Sandstone is composed of medium- to fine-grained quartz sandstone and is bodied with weak calcareous cement. The sandstone contains many lenticular beds of cherty limestone. Because of their homogenous lithologies and loose cementation, the Navajo Sandstone and Lukachukai Member of the Wingate Sandstone are the primary water-producing units in the N-aquifer system (WHP 2008d, pg. 2-35).

The Dakota Aquifer

The Dakota is a significant aquifer in the region. The system includes the Entrada Sandstone, Summerville Formation, Cow Springs Sandstone, sandstone members of the Morrison Formation, and the Dakota Sandstone. The Entrada Sandstone and Summerville Formation both consist of a sandstone and silty sandstone facies. In both cases, the silty facies is well cemented. The Cow Springs Sandstone is well-sorted, fine-grained quartz that is also firmly cemented. These deposits are extensive, encompassing the southern half and western portion of the region. The sandstone tongues are quite extensive and intertwine with members of the Morrison (WHP 2008d, pg. 2-35).

The Morrison Formation is the uppermost Jurassic unit in the region, and is comprised of four members. These are from oldest to youngest: (1) the Salt Wash Member, which consists of fine- to coarse-grained lenticular sandstone beds and mudstone; (2) the Recapture member, which consists of friable fine- to medium-grained sandstone interstratified with shaly mudstone; (3) the Westwater Canyon Member, which consists of fine- to coarse-grained sandstone and minor shaly mudstone; and (4) the Brushy Basin Member, which consists of shale interbedded with some mudstone and fine- to medium-grained sandstone. The Cretaceous Dakota Formation is comprised of three lithologic types deposited under fluvial, lagoonal, and shallow marine conditions. The lower fluvial member consists of well-cemented, medium- to fine-grained quartz

sandstone with a basal conglomerate in some places. The middle member consists of carbonaceous flat-bedded mudstone and siltstones, coal, and interbedded sandstone lenses. The upper shallow marine sandstone member differs somewhat in lithology from the lower because it has a greater amount of very fine sand and silt and in several areas forms alternating sandstone ledges and intercalated shaly beds. The water quality is marginal to unsuitable for drinking due to sulfate and dissolved solids concentrations exceeding the U.S. Public Health Service's recommended drinking water limits (WHP 2008d, pg. 2-36).

Wetlands and Floodplains

Historical surface water flow data is not available for most of the FBFA, nor are flood plain maps. There are some recorded wetlands in the Chapter mainly in association with riverine and freshwater forested shrub areas along the Little Colorado River and fresh water ponds located south of the community of Coalmine Canyon (US Fish and Wildlife Service 2016). Flood plain boundaries have not been determined by federal, state, or tribal entities. An inquiry with the Federal Emergency Management Agency in 2016 revealed that the Flood Insurance Rate Map (FIRM) for the unincorporated areas surrounding Coalmine Canyon, Arizona, dated September 3, 2010, showed no flood prone areas (FEMA 2016).

Water Rights

Water rights from the Colorado River have been tied up in litigation for many years. Chapter residents feel they should have access to the Colorado River, based on historical use. The Chapter needs to look into acquiring water rights to the Colorado River and Little Colorado River in order to provide water to the community (WHP 2008d, pg. 4-18).

Chapter Water Needs

According to field data collected by WHPacific in 2008, 32 percent of homes in the Chapter use septic systems and 28 percent use outhouses. The lack of wastewater infrastructure in the Chapter explains the high occurrence of septic systems and outhouses (WHP 2008d, pg. 2-55).

Many scattered-site homes are not connected to municipal water systems due to their remoteness and cost and the inefficiency of extending these systems to isolated locations. At the same time, the Chapter’s vision includes each home having adequate plumbing and access to safe water for drinking and domestic use. Those homes located close to existing water systems should be hooked up. Those too far from existing systems should be retrofitted for plumbing and provided nearby watering points where safe water for drinking and domestic use can be collected and hauled (WHP 2008d, pg. 3-5).

Many of the homes in the Chapter use septic systems to handle wastewater. While septic systems sometimes pose environmental risks, particularly to the water table, in higher density residential areas and areas with a high water table, meaning groundwater is close to the surface and therefore at high risk for contamination from septic tanks, the issue with septic tanks in Coalmine Canyon is more due to the remoteness of residences (WHP 2008d, pg. 2-55).

Septic tanks require occasional servicing to empty the tanks and flush the lines. The remoteness of many scattered sites homes means that these services cost more than they would to service areas that are easier to reach and closer to Page or Flagstaff, where private service companies are located. Many residents of these remote homes subsist on ranching and may not have the additional cash to pay for septic tank servicing, no matter what the cost of service is. As a result, many septic systems are abandoned once the tank is full, and residents resort to using outhouses or simply letting sewage pool and evaporate naturally, which poses a human health risk. Addressing this issue will require policy decisions and perhaps new programs to either provide financial assistance to cover the cost to service septic tanks or provide public services to empty septic tanks, which will also necessitate constructing a facility where collected waste can be safely treated (WHP 2008d, pg. 2-55).

The Chapter needs to develop a wastewater reclamation facility that thoroughly cleans wastewater so that effluent does not pollute streams or groundwater. The water released by this treatment facility could potentially be used to irrigate landscaping and parks (WHP 2008d, pg. 3-5).

Coalmine Canyon Agricultural Resources

Community Farmers

Coalmine Canyon residents consider traditional, community farming of crops such as corn, squash, and beans very important to their way of life. Most of the agriculture that occurs within this Chapter, and the majority of the Navajo Nation, is defined by small family farms sized between 0.1-9.0 acres (US Census of Agriculture 2014).

In order to perpetuate the type of farming traditional to the Navajo, Chapter members would like to cultivate small farms to produce food for Chapter members. This type of community-based agriculture would help preserve the way of life for Chapter members, stimulate commerce within the Chapter, and enhance the sustainability of the community (WHP 2008d, pg. 3-11).

Coalmine Canyon Soils

Generally, three primary soil categories occur within the planning area, including soils MAl, MA2, and MA6. The primary soil type in the Chapter is MAl, with less occurrence of MA2. Even less of the MA6 soil type is in existence, and that is mostly along the Little Colorado River (WHP 2008d, pg. 2-33).

The soils in MAl, Badland-Torriorthents -Torrifluvents Association, are shallow to deep, moderately fine-textured material from eroded from rock formations. Badland makes up about 40 percent of the association, Torriorthents 25 percent, and Torrifluvents 25 percent, with minor areas of associated soils and rock outcrop being about 10 percent. The Moenkopie-Shalet-Tours Association (MA2) consists of well-drained soils on plateaus and flood plains. The soils in MA2 are shallow and deep, moderately-coarse to moderately-fine textured. Moenkopie soils make up

about 60 percent of the association, Shalet soils 15 percent, Tours soils 15 percent, with minor areas of associated soils being 10 percent (WHP 2008d, pg. 2-33).

The Fruitland-Camborthids-Torrifluvents Assocation (MA6) consists of well-drained soils on the high plains. The plains are broken by occasional steep-sided drainage ways and scattered buttes. Fruitland soils and closely associated unnamed shallow and moderately deep Torriorthents make up about 50 percent of the association, Camborthids 30 percent and Torrifluvents 15 percent, with small areas of rock outcrop and minor included soils being 5 percent (WHP 2008d, pg. 2-33).

Land Suitability sites for development were identified in the CLUP 2008, and the Chapter should continue to consider soil profiles in regards to suitable development sites within the FBFA.

Coalmine Canyon Biological Resources

Threatened and Endangered Species and Resource Protection Zones

Portions of the Chapter contain some sections classified by NNDFW as Resource Protection Zone 1, a highly-sensitive wildlife resource area. Within the Chapter, Area 1 incorporates the Little Colorado River, the Ad'ee Chii Cliffs, and Coalmine Canyon. The Little Colorado River is protected with a buffer zone from thick riparian vegetation to protect the yellow-billed cuckoo and southwestern willow flycatcher. The remaining area within the Chapter is designated as Resource Protection Zone 3, which is considered a low sensitivity area. (WHP 2008d, pg. 2-39).

C**oalmine Canyon Mineral Resources**

Minerals

Coal is found north of the Chapter House, and a vein of coal less than 10 feet thick is exposed along the rim of Coalmine Canyon in the northern portion of the Chapter. About a mile north of the Chapter House, on the other side of Highway 264, is a nonfunctioning coal mine. This mine was abandoned because of an extensive underground fire that smoldered for nearly 10 years, according to local residents. Evidence of the burn is still visible after 20 years of weathering (WHP 2008d, pg. 2-42).

From the 1940s through the 1970s, hundreds of uranium mines were opened throughout the Navajo Nation, including the western portion of the Coalmine Canyon Chapter. This led to construction of open pits along the Little Colorado River, and uranium was mined from these areas until 1960. Abandoned for years, the pits were reclaimed by 2000 (WHP 2008d, pp, 2-42).

Sand and gravel also exist within the Chapter, and there are at least two borrow pits within the community. One borrow pit is located just east of the Chapter House, and the other is located along N 6731, eight miles southwest of Tuba City. Pumice and clay are also found in the area, and they are located on the western part of the Chapter, near the Little Colorado River (WHP 2008d, pp, 2-42).

Coalmine Canyon Cultural and Traditional Resources

Cultural Resources

The community of Coalmine Canyon is rich in archeological sites. There are significant archaeological sites including historic and prehistoric ruins, burial grounds, and inscriptions made by human groups. The cultural sites in the planning area include the presence of surface artifacts that appear to indicate a substantial subsurface component (WHP 2008d, pp, 2-44).

Many archaeological inventories have been conducted in the chapter, and numerous archeological sites have been recorded with the NNHHPD. Prior to development of any kind, the NNHHPD, Chapter Officials, chapter members should be contacted to conduct a records check of the inventory of currently known cultural resources in the project area. A cultural resources survey of each project area should also be performed before any development begins (WHP 2008d, pp, 2-42).

The Chapter has also identified AOA, as previously discussed in the Coalmine Canyon Land Use section. The Navajo's traditional subsistence lifestyle includes using the land to gather a variety of plants/herbs for medicinal and ceremonial purposes and materials for arts and crafts. The areas that provide these resources are considered "areas of avoidance" – traditionally and culturally sensitive areas to be protected from development in perpetuity to preserve their historic significance or ongoing ceremonial use.

Coalmine Canyon Chapter Community Needs Assessment

The community needs assessment is based on information provided from the community workshops in 2008 that were hosted by WHPacific, Inc., comments provided by the community, and professional field assessments completed by WHPacific, Inc. in the summer of 2008 (Coalmine Canyon CLUP).

The community needs assessment includes Chapter Vision and Goals for the FBFA, resource needs, identification of specific actions and projects that need to be implemented in the FBFA, project phases by timeline, and preferred development sites within the Chapter.

Coalmine Canyon Development Vision

The Chapter envisions a community where its people can live and prosper, without limitations to their land, in a safe and self-sustaining environment with a growing, balanced, and diversified economy that prudently uses its natural and cultural resources, enhances employment opportunities, and improves the quality of life for its people (WHP 2008d, pg. 3-1).

The Coalmine Canyon Chapter would like to achieve this vision in the following way (WHP 2008d, pg. 3-2, 3-3);

Economic development will improve quality of life for the Chapter and retail and recreational opportunities for tourists. Ranchers will have nearby water resources for livestock. Chapter vendors will be able to sell Navajo arts and jewelry to tourists. Affordable groceries will be available at a store within the Chapter. A business incubator will help local entrepreneurs start new businesses. The Chapter will also have expanded government facilities such as a tribal court facility and a post office to better serve the region.

Future economic development opportunities including a 70-acre destination resort and casino with amusement park style entertainment for younger visitors will help attract tourists to the area and will generate income. Small retail developments including a convenience store, a vending market, and a rug auction will create more employment opportunities within the community and create supplemental income to the resort and casino. Future large-scale developments including a regional mall could be supported if the casino proves to be popular. Commercial developments including a laundromat, automotive repair business, and fast food restaurants will provide retail and service amenities to the community.

Chapter residents will have a full range of education opportunities from school age through adulthood, including childcare, job training, leadership cultivation, culture and language sharing, and personal and business finance management. New or improved facilities will provide the best opportunities for students.

Better transportation infrastructure will provide safe and adequate public access to and within the community and support the movement of goods and services throughout the region. The most heavily traveled roads will be paved, and the Chapter will have equipment to properly maintain unpaved roads.

Community facilities and parks will provide places for Chapter members to congregate. A baseball field, a skate park, and a multi-purpose center will provide space for residents to participate in athletic activities. Picnic grounds near the Canyon will allow tourists and residents alike to appreciate the beauty of the land.

Nearby emergency health, fire, and police facilities and substations will provide quick response to medical and safety emergencies. Helicopter service to Tuba City will be available to respond to major emergencies. All homes will be given addresses for emergency response and within range of reliable cell phone service.

A study on effects of uranium mining will help the Chapter create a program for restitution for health effects. Existing uranium mines and test pits will be closed and remediated to prevent further contamination.

All residents who wish to live in Coalmine Canyon will have safe, durable, energy-efficient homes with access to electricity and safe drinking water, whether they are located near the center of the community or in remote areas. Residents will have a full range of housing options to

support each stage of life and all financial circumstances. Chapter members can live in scattered homesites if they are grazers who prefer to live a subsistence lifestyle, or clustered housing developments if they prefer the amenities and infrastructure of a modern community. Mobile home parks, apartments, and rental houses will be available for people who may need to move from the Chapter in the future or for people who are in immediate need of a home. Living facilities for the elderly will allow independence while also providing assistance with preparing food, social opportunities, and medical care.

Guiding Development Principles

With the development goals, in mind the Chapter has developed guiding principles that would apply to each development project (WHP 2008d, pg. 3-5). The Chapter would like to provide for people's basic needs, such as power and water. The Chapter needs to plan for improving the overall health of its members. Public safety and emergency medical service needs improvement to better respond to emergency situations (WHP 2008d, pg. 3-5).

Sustainable construction should be required for all new buildings. These buildings should be energy-efficient and designed to last many generations. Structures should be designed to work with the land in order to provide passive solar energy to further reduce energy costs, achieving the goal of Chapter self-sufficiency (WHP 2008d, pg. 3-5). These structures should provide optimal protection from the elements with high-quality insulation to better regulate indoor temperatures and raised floors to protect against flooding.

New developments should not harm the natural environment or negatively impact traditional ways of life. It is important to protect water quality and groundwater for future generations. Other natural resources such as mineral deposits should also be used wisely to ensure sustainability. Any cultural sites within the Chapter should also be preserved. New developments in the Chapter should incorporate community-supported agriculture to provide healthy local food to the community (WHP 2008d, pg. 3-5).

The Chapter needs to protect and provide scattered housing as an option for remote areas and ranchers. Fencing around homes and cornfields will help keep cattle away from property that is easily damaged. Grazing areas should be located where cattle can be easily watched. Grazing should be protected as an ongoing way of life for people in the Chapter. The Chapter must educate grazing-permit holders on better range management practices and work to enforce these practices to ensure that this way of life can remain sustainable (WHP 2008d, pg. 3-5).

The Chapter needs to plan to provide jobs for the large and growing young population. According to Chapter members during the workshops, many members have moved to other communities in order to find employment. Creating jobs within the Chapter is essential to keeping younger population within the Chapter, or at least providing that opportunity (WHP 2008d, pg. 3-5).

New housing subdivisions should be built near necessary resources. Housing clusters should be constructed in areas where water and electricity is already available. These housing developments sites should also be located with easy access to community amenities such as emergency access (WHP 2008d, pg. 3-6).

It is important for the community to plan ahead before proceeding with growth. The Chapter needs to protect natural resources such as water, wildlife, and cultural areas. Plans need to be created to handle the hazards of new industrial opportunities before committing to new operations (WHP 2008d, pg. 3-6).

Coalmine Canyon Chapter Development Obstacles

The Coalmine Chapter has identified development obstacles and formulated possible solutions to surpass or avoid them. Some of the Chapter sees communication, range management, fairness of policies and procedures, protection of cultural and natural resources, and creation of internal Chapter support as obstacles (WHP 2008d, pg. 3-4, 3-5).

Coalmine Canyon Chapter Strategic Directions

In order to surpass these development obstacles, the Chapter has identified strategic directions for each obstacle. For improved communication, the Chapter can identify and appoint key community spokespersons to represent projects. These leaders would form a project committee that communicates with the Chapter leadership. Chapter officials need to explain and discuss new plans face to face with community members. The site selection process should become a public process that includes current nearby residents. Communication through local media will help notify residents of upcoming meetings and projects (WHP 2008d, pg. 3-4).

For improved range management, the Chapter needs to deputize a grazing officer to patrol Chapter grazing lands on horseback. Grazing permits need to be redefined to establish clear criteria and accountability. Written agreements should be used whenever possible to define grazing permits and agreements. The management plan should limit permits to one year, with a three-month monitoring period. In addition to the grazing officer, a local range rider should provide additional enforcement support. A fee should be introduced for windmill use to prevent abuse of water use. Partnerships with neighboring range management plans will avoid conflicts with grazers in other chapters (WHP 2008d, pg. 3-4).

To ensure enforcement of fair policies and procedures the Chapter will need to ensure that officials at the local level are fairly administering and enforcing policies and procedures. All rules should be applied fairly and equally. A checks-and-balances system will help ensure the fairness of the government. Chapter members need to hold leaders accountable for their promises (WHP 2008d, pg. 3-4).

Protecting cultural resources and traditional ways will be ensured by making culturally and religiously specific counseling available to Chapter members. This type of counseling should respect the needs and beliefs of the Chapter people. The Chapter needs to coordinate with other map providers to help locate and preserve historical sites. The Chapter should engage in a public education and awareness campaign about these sites. All sacred, culturally important, and historic sites need to be inventoried, even if they are not maintained on a map, and archaeologically evaluated (WHP 2008d, pg. 3-4).

Regulations for these preservation areas need to be established. Regulations for off-road vehicle use around these sites need to be established and enforced (WHP 2008d, pg. 3-4). The Chapter needs to decide as a community how to pass knowledge of and responsibility for these sites from elders to younger generations (WHP 2008d, pg. 3-5).

Conservation of natural resources is important to Chapter members. Not only is it part of the people's heritage, it is necessary for living with the limited resources available on Chapter land. The Chapter needs to develop a wastewater reclamation facility that thoroughly cleans wastewater so that effluent does not pollute streams or groundwater. The water released by this treatment facility could potentially be used to irrigate landscaping and parks. Careful site selection for new developments will help ensure minimal environmental impact (WHP 2008d, pg. 3-5).

The Chapter can create internal support by hiring support such as a grant writer or planner will help the Chapter better support government at the local level. The Chapter also needs to find ways to generate income to help fund projects and make up for funding shortfalls (WHP 2008d, pg. 3-5).

Coalmine Canyon Chapter Community Needs

Community Resource Needs were identified and divided into the following areas;

- Infrastructure/Utility
- Transportation
- Housing
- Health and Public Safety
- Community Facilities
- Economic Development
- Education
- Open Space, AOA, and Grazing

Infrastructure

Improved cellular communications infrastructure will improve quality of life and safety for all residents. Some rural Chapter members do not have cell phone service or other telecommunications service at their homes. People have to drive to locations where cell phone

service is available in order to make a phone call, a major inconvenience and huge safety issue in emergencies, as it adds time to emergency response. In addition to spotty cellular communications, Internet access is also sparse but could be provided easily in designated areas with wireless service (WHP 2008d, pg. 3-6).

Many scattered-site homes are not connected to municipal water systems due to their remoteness and cost and the inefficiency of extending these systems to isolated locations. At the same time, the Chapter's vision includes each home having adequate plumbing and access to safe water for drinking and domestic use. Those homes located close to existing water systems should be hooked up. Those too far from existing systems should be retrofitted for plumbing and provided nearby watering points where safe water for drinking and domestic use can be collected and hauled (WHP 2008d, pg. 3-6).

As part of the FBFA Recovery Plan, a system of residential zones is being proposed to distinguish among those homes close enough to hook up to existing municipal water systems, those homes already in close proximity to safe watering points, and those homes in remote locations that must haul water from long distances. There are two major issues facing those in remote homes. One is the cost, stress, and labor of hauling the water from far away to their homes – a particular burden for elderly residents living alone and their families who help care for them. Another is the risk that many people in these remote areas resort to using water from nearby windmills or earthen dams instead of traveling long distances to a safer water source. Water from windmills and earthen dams, intended for livestock use, is not tested for water quality and is at risk for airborne and bacterial contamination from contact with animals (WHP 2008d, pg. 3-6).

Improving access to safe domestic and drinking water, as well as water for livestock and irrigation, will rely on policy decisions about how best to provide water in remote locations (WHP 2008d, pg. 3-6). Providing more safe watering points is one approach; providing a regional system of water delivery might be another. Technology exists to solve any number of problems, once the community decides on what problem to solve and what a successful solution will look like. Some solutions will be more costly or more efficient than others, but strong leadership and clear decision-making, starting at the chapter level, will still be needed to set the parameters of what solutions the community demands (WHP 2008d, pg. 3-7).

The municipal water service needs new waterlines to replace the existing copper waterlines that have exceeded their useful life. The existing water service needs to extend beyond the current service area, and additional water storage tanks are needed to handle the additional demand (WHP 2008d, pg. 3-7).

Similarly, a system with a range of power-source solutions based on distance from existing power lines could provide electricity to all residences in the Chapter. Those closest to existing or planned power lines would be hooked up. Those in more remote areas could be retrofitted or

built to use solar power with wind-powered backup generators. A maintenance service for this off-the-grid utility service would also need to be established (WHP 2008d, pg. 3-7).

There is a landfill located within the Chapter. This landfill is beyond its useful life and does not meet modern environmental standards. It needs to be closed and reclaimed. Trash collection is limited and unreliable in the Chapter. There is no dedicated solid waste transfer station in the Chapter. Trash collects in numerous locations, which creates a health hazard. The use of trash dumpsters will prevent blowing waste from polluting the landscape. A recycling center will reduce the amount of household waste that goes to a landfill. A program is needed for cleaning illegal dumpsites that occur, especially along drainage areas and washes (WHP 2008d, pg. 3-7).

Transportation

Community members voiced deep concerns regarding accessibility and the need for improvement and maintenance of all roads within the Chapter. The non-paved roads become very muddy and impassable during inclement weather. The road serving the northeastern part of the Chapter is proposed for paving. This road extends from Highway 264 and travels north around Coalmine Canyon (WHP 2008d, pg. 3-7).

Road improvements are also desired for a portion of N6720 near Goldsprings. This area floods during inclement weather and becomes impassable. The main arterial road paralleling the Little Colorado River is also proposed for paving. This road serves the southwestern portion of the Chapter (WHP 2008d, pg. 3-8).

Housing

At the community planning workshops, participants identified the top need as housing, particularly in the FBFA. Chapter members desire new homes constructed of long-lasting materials. A diversity of housing types is needed within the Coalmine Canyon Chapter. Group homes for the elderly are needed to house the aging population. In the past, many newly constructed homes were provided to elders, leaving young families in need of housing. Clustered housing is needed in the central community area near municipal utilities and other community amenities. There is also a need for mobile homesites and apartments, which are ideal for residents who do not have time to acquire a homesite lease or who might want to move elsewhere in the future (WHP 2008d, pg. 3-8).

Health and Public Safety

Response time to emergencies throughout the Chapter is too long to assure public safety. Chapter members have expressed a need for a police substation within the FBFA of the Chapter. The nearest emergency health facility is in Tuba City. A quick responding helicopter unit is needed to provide expedited response to medical emergencies. Many homes within the Chapter do not have physical addresses. These homes need to be given addresses in order to help emergency personnel locate a site (WHP 2008d, pg. 3-9).

As of 2008, the Navajo Nation has been working on a rural addressing system for 911 emergency response. This project will map and assign an address to all homes in the Chapter. Chapter members expressed a need for a local trauma center within the Coalmine Canyon town site and a second satellite health clinic in the FBFA. A care center for the aging population is also needed (WHP 2008d, pg. 3-9).

Community Facilities, Parks, and Recreation Needs

Community facilities and services are an important part of the community vision. A senior citizens center is needed for the aging population in the Chapter, and a daycare is needed for children younger than pre-school age. A multi-purpose community center will provide a place for community members to congregate for recreational activities or community meetings. Coalmine Canyon also needs a cemetery within the Chapter. Community recreation facilities will also be an important element in improving the quality of life for people in the FBFA. Community facilities provide a place for youth and adults alike to congregate. A skate park for teenagers and playground equipment for younger children are desired by the Chapter for youth. A boys and girls club would also provide activities for the Chapter youth. Chapter members also desire a recreation center and firing range (WHP 2008d, pg. 3-9).

Economic Development

The Chapter needs economic development projects to strengthen the community. Many people in the Chapter are skilled artisans. A rug auction and a vending market will provide a place for Chapter members to sell their wares. A business incubator is needed to help people in the region achieve their entrepreneurial goals. Many residents of the Chapter are ranchers who raise livestock. A nearby veterinarian is needed to help ranchers care for medical issues of livestock. The Chapter is surrounded by beautiful landscapes and geologic sites. A tourist attraction at the meteor crater will attract more people into the Chapter and help generate income (WHP 2008d, pg. 3-10).

A healthy diversified economy provides many opportunities for jobs, education, and improved health as well as a widely shared and sustainable quality of life and environment, pride in one's own community and hope for the future. A thriving economy is also important for the Chapter because an increased tax base will enhance the community's livability or viability by supporting, maintaining, and improving roads, Chapter facilities, and emergency medical services. Job development will provide higher skills, better wages, benefits, and opportunities for advancement. Local businesses will feel appreciated by the community and be more likely to stay in town. Further, locally produced goods are more likely to be consumed at the local level and the productivity of the land can be maximized while still preserving the environment (WHP 2008d, pg. 3-10).

Education

The Chapter wishes to improved education. Although there are numerous educational opportunities for the school-age population, there are no educational services for adults and the

population younger than kindergarten age. Adult and continuing education services are far from the community. There are no pre-schools or childcare facilities near Coalmine Canyon. The lack of facilities for the younger population can make finding childcare difficult for working families with young children (WHP 2008d, pg. 3-10).

The Chapter needs to secure funding for continuing education programs and pre-school programs. An educational needs assessment needs to be conducted in order to justify new schools within the Chapter (WHP 2008d, pg. 3-10). Suitable sites need to be identified and withdrawn for any new facility. The Chapter will have to coordinate with other government agencies to secure funding for new educational facilities and programs (WHP 2008d, pg. 3-11).

Open Space, "Areas of Avoidance," and Grazing Needs

Raising grazing animals is a way of life for people in the Chapter. Much of the land within the Chapter is leased to grazing-permit holders. Over time, poor range management has caused problems on grazing land. There is not a ranger station near the Chapter to support the patrol of grazing land. Grazing animals have been reported stolen, and some permit holders have exceeded limits of livestock numbers. The Chapter needs to provide grazing areas that can be easily watched (WHP 2008d, pg. 3-11).

Poor range management has also resulted from the lack of land conservation programs and education. Much of the grazing lands are not fenced, thus allowing grazing animals near homes, agriculture sites, and environmentally sensitive areas such as steep slopes. Range management education, increased range enforcement, and fencing are needed in order to allow grazing to continue within the Coalmine Canyon Chapter (WHP 2008d, pg. 3-11).

Agriculture and farming are also important to the way of life for the people of the Coalmine Canyon Chapter. In order to perpetuate the type of farming traditional to the Navajo, Chapter members could cultivate small farms to produce food for Chapter members. This type of community-based agriculture would help preserve the way of life for Chapter members, stimulate commerce within the Chapter, and enhance the sustainability of the community (WHP 2008d, pg. 3-11).

Coalmine Canyon's desert landscape home is delicate. The Chapter needs to create programs to protect water quality, wildlife, and minerals in the area. During the community workshops, participants identified several "areas of avoidance." These areas need to be inventoried and perhaps mapped. If necessary, these sites should be fenced in order to keep grazing animals away from sites that could be damaged, and regularly patrolled to protect against vandalism and unsanctioned poaching (WHP 2008d, pg. 3-11).

Coalmine Canyon Chapter Priority Capital Improvement Projects

These needs are fully outlined in the Coalmine Canyon 2008 CLUP (WHP 2008d). Once these resource needs were identified, the Chapter voted on which actions/projects should be addressed

first through a vote. The top five projects the residents would like to see occur first include a communications tower, a casino (70-acres, with hotel, fast food), a nursing home near chapter, auto repair/auto parts store, and a power line extension for 80 families along Highway 264 in a one-half mile radius from the Chapter House (WHP 2008d, pg. 3-12).

Coalmine Canyon Chapter Priority Project Phasing

This section outlines the phasing of the projects that received the most individual votes from Chapter residents at the community workshops. Phase 1 would be constructed in 5 years or less, Phase 2 would be constructed in 5-10 years, and Phase 3 projects would not be complete for another 10-15 years (WHP 2008d, pg. 3-12).

Phase 1 Projects: 1-5 Years

The following represent the projects identified as part of Phase 1 Developments by the voting groups. These are considered the items most urgently needed by Chapter residents (WHP 2008d, pg. 3-14):

- Church development (Azee 'Bee Nahaga)
- Memorial/community cemetery (10 acres)
- Community garden - corn, squash, tomatoes
- EMT/ambulance service
- Nursing home near Chapter
- Independent Living Project - senior citizen housing close to Chapter House, w/garden, sheep, activities (30 acres)
- Affordable houses (40 homes)
- Trailer Park
- Cell Tower
- Power line extension for 80 families along Hwy 264 (1 1/2 mile radius from Ch. House)
- Solar power with wind power backup generators - 24 families farthest from the existing power lines
- Solid waste transfer station and dumpsters
- Water for livestock with faucet near Chapter
- Land fill at Ward Terrace
- Communal grazing area - big
- Communal grazing area - small
- Baseball field
- Skate park
- Recreation trail - windmill to Tuba City
- Road improvements and future roads, N6720 route
- Road grader

Phase 2 Projects: 5-10 Years

These are projects that realistically will take 5-10 years to get on the ground (WHP 2008d, pg. 3-15):

- Truck stop - gas station, fast food, convenience store, laundry, grocery, auto repair, auto parts
- Public safety complex - police and fire dept.
- Post office
- School: pre-school through high school - including special needs facilities
- Health clinic - diabetes dialysis, counseling offices (grief/trauma)
- Phone/Internet/cable lines - 150 families in 414-acre Resettlement Tract
- Multi-purpose community center - youth recreation center/gym for sports
- Paved roads to homes
- Casino (70-acres, with hotel, fast food)
- Library
- Rug auction/vending market
- Adult education facility / science lab / college extension courses / higher education / vocational facility - training programs in sustainable building / maintenance (wind generators, etc.) / contractor certification / Project Management training
- Waterlines to houses – for 32 to 55 families in Goldsprings
- Tree planting program
- Fencing for cornfield
- Park with basketball and picnic grounds
- E.M.T./ambulance service
- Pave Coalmine Road from Sand Springs to Tolani Lake

Phase Projects: 10-15 Years

The following represents the project identified by one small group as part of Phase 3 Developments. This project should be considered part of future efforts to expand economic development opportunities for local residents, including providing additional jobs and adding on to existing livestock management knowledge and expertise (WHP 2008d, pg. 3-15):

- Scattered housing - self-sustainable and remote housing - south (40 homes)
- Museum and cultural center
- Close and clean landfill

Preferred Development Sites

The Chapter identified several areas as ideal locations for future development (WHP 2008d, pg. 3-14):

Most of these potential development sites are located along US Highway 89 and US Highway 160. Additional centers are proposed along Arizona Route 99 and Navajo Route 2 in Leupp and Tolani Lake (WHP 2008d, pg. 4-18).

Several potential development sites were identified at locations away from the business centers. These include locations suitable for wind power generation, agricultural development, and home based businesses. Potential sites for wind farm development are in Cameron just west of Gray Mountain, in Coalmine Mesa along the escarpment of Adeii Echii Cliff. A feasibility study was requested to verify the potential for wind power generation in these locations. Agricultural projects are geared to on-site improvements, such as earthen dams to create livestock ponds, moveable and permanent fencing, and pasture improvements. These projects are dispersed throughout the Chapter and would benefit individual sites. The appropriate project might be designed as a program of technical and financial assistance (WHP 2008d, pg. 4-18).

2.7.4 Coppermine Chapter

The Coppermine Chapter is located in the southwestern part of the Navajo Nation. The Chapter is approximately 244,580 acres in size. Tuba City is to the southeast, Bodaway Gap is to the west and south, and Lechee is to the north. The western planning boundary is defined by Echo Cliffs, the eastern edge runs through Mormon Ridge, the southwestern end follows Crooked Ridge to Gap, and the north point goes almost to the Colorado River. This area covers well over 240,000 acres (WHP 2008e, pg. 1-5). Thirty-eight percent of the Chapter's 244,580 acres is within the FBFA (WHP 2008e, pg. 1-1), and these acres are located in the southern portion of the Chapter (WHP 2008e, pg. 1-5).

The Chapter was started in the 1930s when an open-pit copper mine was founded. A trading post associated with the mine was also built. The Chapter House was built in 1959 in a remote area, just south of the mine and trading post. The road to the Chapter House remains unpaved. The mine has been closed since 1968, and the trading post has also been abandoned (WHP 2008e, pg. 1-5).

Coppermine Chapter Physical Setting

Chapter elevations range from 4,800 to 7,000 feet above sea level. Echo Cliffs, Cedar Tree Hills, and Cornfield Valley are along the southwest study boundary. Marble Canyon is located northwest of the northern end of Coppermine's study area. Circular White Ridge runs along the northeast study area in a north/south direction, and Mormon Ridge runs along the southeastern edges of the study area. Crooked Ridge is the southern edge of Coppermine's study area. The Gap is outside but at the southernmost tip of the study area (WHP 2008e, pg. 2-27).

Slopes greater than 50 percent were calculated for the Coppermine planning area. These slopes are predominantly along the Echo Cliff region along the southwest edge of the planning area, including Antelope Pass (WHP 2008e, pg. 2-27).

Steep slopes are generally unsuitable for intense development. Level and more moderate slopes constitute the majority of the study area. Figure 13 shows areas with slopes greater than 50 percent, which is unsuitable for construction (WHP 2008e, pg. 2-27).

Coppermine Chapter Land Status

The Chapter is located within Navajo Nation Land Management District 3 and consists of one community, rangeland, and open space. The Chapter is comprised of trust land with no private holdings. The Coppermine 2008 CLUP (WHP 2008e) does not contain any information regarding land disputes within its border (WHP 2008e, pg. 2-25).

Coppermine Chapter Land Use

The majority of the Chapter's land is used for grazing cattle and sheep. Coppermine is located within Grazing District 1 and Sub-Unit 3 (WHP 2008e, pg. 2-25). Ranger stations to patrol grazing land within the Chapter are located at a distance of at least 174 miles away, in Chinle and Shiprock.

The lack of ranger stations within the Chapter has resulted in insufficient range enforcement. There is also a lack of range preservation programs and public education in the Chapter. The lack of an adopted range management plan has resulted in deteriorating conditions. Overgrazing has caused increased soil erosion and inadequate vegetation for livestock. Most grazing areas are not clearly identified or fenced. This has resulted in loose cattle that damage cultural sites, invade homesites, and cause irreversible damage to environmentally and culturally sensitive areas such as steep slopes, riparian corridors, and AOA (WHP 2008e, pg. 2-25).

Coppermine Chapter Population and Housing

The 2010 US Census lists the Chapter population as 590 individuals. The Chapter has one community where some tribal members reside, Coppermine. In 2008, it was estimated that 70 percent of the existing Chapter homes are scattered (WHP 2008e, pg. 4-3).

The majority of homes are owner-occupied, but there are a considerable number of vacant homes. The Chapter's owner-occupancy rate is lower than the Navajo Nation's and Arizona's largely due to residents maintaining seasonal homes for recreational and livestock activities. The majority of homes (95%) in the Chapter are single detached homes (WHP 2008e, pg. 2-8).

The majority of homes were built between 1970 and 1998. This high rate of older homes in combination with the improvement restrictions of the Freeze might indicate that a significant number of homes need rehabilitation or replacement (WHP 2008e, pg. 2-9).

Coppermine Chapter Government and Utility Infrastructure

Infusing Chapter residents with a spirit of community was identified as a priority in the 2008 community workshops. The Chapter lacks residents as many younger families with children have moved away to seek a higher quality of life and opportunities elsewhere (WHP 2008e, pg. 3-4). This is reflected in the Chapter's lack of a business plan that prioritizes community projects and establishes a process of what needs to be done, such as withdrawing land for development. Many of the funds released by the federal government have an expiration date. Since the government often only provides a small fraction of funding to a project, the expiration date passes before the Chapter can collect the remainder of funds. The Chapter feels that very little tribal funding trickles down to the Chapter to complete projects (WHP 2008e, pg. 3-4).

The availability of utilities is very limited throughout most of the Chapter. A number of wells and springs are scattered throughout the Chapter. There are 22 Chapter wells and one NTUA public water system well within the Chapter planning area. Despite the number of wells, there are few home-sites that are hooked into a water delivery system. The well sites are primarily for livestock and have not been treated for safe human consumption. The majority of community members have to haul water to the homes. Small earthen dams were created to capture surface drainage for livestock watering holes (WHP 2008e, pg. 2-35).

There is no wastewater infrastructure in the Chapter. Most Chapter members rely on outhouses and septic tanks. Almost 64 percent of homes use outhouses. Approximately 18 percent of the homes in the Chapter use septic systems to handle wastewater. While septic systems sometimes pose environmental risks, particularly to the water table in higher density residential areas and areas with a high water table, meaning groundwater is close to the surface and therefore at high risk for contamination from septic tanks, the issue with septic tanks in the Chapter is more due to the remoteness of residences. Septic tanks require occasional servicing to empty the tanks and flush the lines (WHP 2008e, pg. 2-35).

The remoteness of many scattered-site homes means that these services cost more than they would to service areas easier to reach and closer to Page or Flagstaff, where private service companies are located. Many residents of these remote homes subsist on ranching and may not have the additional cash to pay for septic tank servicing, no matter what the service costs. As a result, many septic systems are abandoned once the tank is full, and residents resort to using outhouses or simply letting sewage pool and evaporate naturally, which poses a human health risk. Addressing this issue will require policy decisions and perhaps new programs to either provide financial assistance to cover the cost to service septic tanks or provide public services to empty septic tanks, which will also necessitate constructing a facility where collected waste can be safely treated (WHP 2008e, pg. 2-35).

The major NTUA power lines run parallel to N-20 and along N20A. With funding sources from various Departments of the Navajo Nation (for example, NTUA, Abandoned Mines), homes are gradually being plugged into the electrical grid. According to the 2008 field study, almost 54 percent of homes are not connected to the power. Existing electricity infrastructure is shown Figure 18 below (WHP 2008e, pg. 2-35).

Natural gas is not available to the Chapter. A majority of the Chapter members use wood and coal for heating. Bottled propane is also available; however, it is imported from Flagstaff and Tuba City (WHP 2008e, pg. 2-37).

Frontier Communications, formerly Navajo Communications Company, serves the telecommunication needs of the Navajo Nation. It provides landline telephone service, leases tower spaces to cellular companies, and offers cable television service. The Navajo Nation Telecommunications Regulatory Commission is responsible for planning the expansion of service coverage and delivery across the Navajo Nation, by both public and private companies. Cellular One and Verizon offer the best coverage for private cellular services on the Navajo Nation, although reception is often reported as unreliable and spotty (WHP 2008e, pg. 2-37).

The Chapter does not have a solid waste collection service. Currently, trash collects in various areas of the Chapter, causing health hazards for residents (WHP 2008e, pg. 2-37).

Coppermine Chapter Health and Public Safety Status

The closest police station and medical service to the Coppermine Chapter House is in Page, twenty-two miles away. Most homes in the rural areas of the Chapter do not have physical addresses. As of 2008 the Navajo Nation has been working on a rural addressing system that will tie phone numbers to a physical address in order to provide 911 emergency responses. This project will require that all homes in the Chapter be mapped and assigned an address (WHP 2008e, pg. 2-11).

According to the Chapter, most residents go to Tuba City Indian Medical Center, Page Medical Center, or Flagstaff Medical Center for medical attention (WHP 2008e, pg. 2-12).

Coppermine Chapter Water

Surface Water

There are no major surface water features within the Chapter (WHP 2008e, pg. 2-29). A number of Chapter wells and springs are scattered throughout the Chapter. There are 22 Chapter wells and one Navajo Tribal Utility Authority (NTUA) PWS well within the Chapter planning area. The well sites are primarily for livestock and have not been treated for safe human consumption (WHP 2008e, pg. 2-34).

Ground Water

The main water source for the Chapter is the N aquifer which dominates the higher plateau region at the 6,000 ft. level. The quality of the water within this system is excellent. The Lukachukai member of the Wingate Sandstone, the Moenave Formation, the Kayenta Formation and the Navajo Sandstone comprise what is referred to as the N-aquifer system.

Wetlands and Floodplains

Historical surface water flow data is not available for most of the FBFA, nor are flood plain maps. There are no recorded wetlands in the Chapter (US Fish and Wildlife Service 2016). Flood plain boundaries have not been determined by federal, state, or tribal entities. An inquiry with the Federal Emergency Management Agency in 2016 revealed that there is no Flood Insurance Rate Map (FIRM) panel for the unincorporated areas surrounding Coppermine, Arizona (FEMA 2016).

Water Rights

There is no discussion of water rights issues within the Coppermine CLUP (WHP 2008e).

Chapter Water Needs

Improved water tanks at windmills are needed to better serve the water hauling stations. If water in these tanks at the windmill will be used for human consumption, then water quality should be regularly monitored. Water storage tanks are needed for each house that is not connected to piped water (WHP 2008e, pg. 3-6).

Improving access to safe domestic and drinking water, as well as water for livestock and irrigation, will rely on policy decisions about how best to provide water in remote locations. Providing more safe watering points is one approach; providing a regional system of water delivery might be another. Technology exists to solve any number of problems, once the community decides on what problem to solve and what a successful solution will look like. Some solutions will be more costly or more efficient than others, but strong leadership and clear decision-making, starting at the chapter level, will still need to set the parameters of what solutions the community demands (WHP 2008e, pg. 3-6).

Coppermine Agricultural Resources

Community Farmers

Coppermine residents consider traditional, community farming of crops such as corn, squash, and beans very important to their way of life. Ranching and farming are important aspects of the community. Much of the land within the Chapter is leased to grazing-permit holders. Overgrazing has caused problems on grazing land and farmland. There is a need for a range management plan to protect grazing and farming areas (WHP 2008e, pg. 3-9).

Coppermine Soils

Much of the Chapter has limited vegetation due to overgrazing and ongoing drought conditions to stabilize the soil conditions during windy or rainy weather. Undifferentiated soil erosion areas are identified along the western and northern perimeter of the planning area. Remaining areas within the Chapter contain moderate soil erosion classification based on slopes of 1%–25% (WHP 2008e, pg. 2-30).

Land Suitability sites for development were identified in the CLUP 2008, and the Chapter should continue to consider soil profiles in regards to suitable development sites within the FBFA.

Coppermine Biological Resources

Threatened and Endangered Species and Resource Protection Zones

Portions of the Chapter contain some sections classified by the NNDFW as Resource Protection Zone 1, a highly sensitive wildlife resource area. This Zone is located on the extreme western border of the Chapter and represents less than twenty percent of the Chapter. The remaining area within the Chapter is designated as Resource Protection Zone 3, which is considered a low-sensitivity area (WHP 2008e, pp, 2-33).

Coppermine Mineral Resources

Minerals

Coconino Copper and Chemical Company opened a large- open-pit mine in the 1880s from which the Chapter takes its name (Navajo Times 2013). The mine closed in 1968 and has since

been reclaimed by Abandoned Mine Lands, along with the smaller holes in the Chapter (Navajo Times 2013).

Coppermine Cultural and Traditional Resources

Cultural Resources

The NNHHPD has inventoried and mapped the locations of several archeological sites and previous project locations, but the entire chapter has not been inventoried. NNHHPD does not reveal the locations of sensitive cultural sites due to the potential for vandalism, robbery, and the need to protect privacy. Hence the specific locations of cultural sites are not identified on maps.

Coppermine Chapter has identified numerous sites where traditional cultural properties are found and all of them have significant meaning to Navajo culture and traditions. Any cultural sites within the Chapter should also be preserved.

The Chapter has also identified AOA, as previously discussed in the Coppermine Land Use section. The Navajo's traditional subsistence lifestyle includes using the land to gather a variety of plants/herbs for medicinal and ceremonial purposes and materials for arts and crafts. The areas that provide these resources are considered "areas of avoidance" – traditionally and culturally sensitive areas to be protected from development in perpetuity to preserve their historic significance or ongoing ceremonial use.

Coppermine Chapter Community Needs Assessment

The community needs assessment is based on information provided from the community workshops in 2008 that were hosted by WHPacific, Inc., comments provided by the community, and professional field assessments completed by WHPacific, Inc. in the summer of 2008 (WHP 2008e).

The community needs assessment includes Chapter Vision and Goals for the FBFA, resource needs, identification of specific actions and projects that need to be implemented in the FBFA, project phases by timeline, and preferred development sites within the Chapter.

Coppermine Vision

The Coppermine Chapter would like to achieve this vision in the following way (WHP 2008e, pg. 3-1).

The Coppermine Community needs to work together to achieve their goals of economic independence in order to develop community facilities to provide services for families, youth, and the elderly.

Coppermine Chapter Goals

Guiding Principles

With the development goals, in mind the Chapter has developed guiding principles that would apply to each development project (WHP 2008e, pg. 3-5). The Chapter would like to provide for people's basic needs, such as power and water. The Chapter needs to plan for improving the overall health of its members. Public safety and emergency medical service needs improvement to better respond to emergency situations (WHP 2008e, pg. 3-5).

Sustainable construction should be required for all new buildings. These buildings should be energy-efficient and designed to last many generations. Structures should be designed to work with the land in order to provide passive solar energy to further reduce energy costs, achieving the goal of Chapter self-sufficiency (WHP 2008e, pg. 3-5). These structures should provide optimal protection from the elements with high-quality insulation to better regulate indoor temperatures and raised floors to protect against flooding.

New developments should not harm the natural environment or negatively impact traditional ways of life. It is important to protect water quality and groundwater for future generations. Other natural resources such as mineral deposits should also be used wisely to ensure sustainability. Any cultural sites within the Chapter should also be preserved. New developments in the Chapter should incorporate community-supported agriculture to provide healthy local food to the community (WHP 2008e, pg. 3-5).

Many members have moved to other communities in order to find employment and better opportunities. Creating jobs and improving the educational system and facilities within the Chapter is essential to keeping younger population within the Chapter (WHP 2008e, pg. 3-6).

Coppermine Chapter Goals

During the community workshops held during summer 2008, community members outlined goals for the Chapter that will aid in reaching this vision. These goals include community policies, capital projects, and community service (WHP 2008e, pg. 3-1).

All residents who wish to live in Coppermine will have safe, durable, energy-efficient homes with access to electricity and safe drinking water, whether they are located near the center of the community or in remote areas. Residents will have a full range of housing options to support each stage of life and all financial circumstances. Chapter members will be able to live in scattered homesites if they are grazers who prefer to live a subsistence lifestyle, or clustered housing developments if they prefer the amenities and infrastructure of a modern community. Clustered housing will be located in Gap (WHP 2008e, pg. 3-1).

Because of the high cost of providing municipal infrastructure to remote houses in the Chapter, solar power with wind-powered back-up generators will be used to provide electricity to scattered rural homes. Rural homes will also have improved access to safe drinking water sources if the cost of connecting them to municipal services is too high (WHP 2008e, pg. 3-1).

The Chapter will provide educational and training opportunities for residents and entrepreneurs to learn how to maintain these off-the-grid utilities. Living facilities for the elderly will allow independence while also providing assistance with preparing food, social opportunities, and medical care. These facilities should be located in the community of Gap or in Habitiin (WHP 2008e, pg. 3-2).

A health clinic will address the trauma due to the former Bennett Freeze, contain a pharmacy, and provide health to all Chapter members. Nine acres have been will be set aside in the Chapter for a health clinic (WHP 2008e, pg. 3-2).

Chapter residents will have a full range of educational opportunities from school age through adulthood, including childcare, job training, leadership cultivation, and culture and language. New or improved facilities will provide the best opportunities for students. The Chapter wishes to improve education, including an 8th to 12th grade educational facility, distance learning, and GED program for Chapter members (WHP 2008e, pg. 3-2).

A multi-purpose community and senior center will provide a place for community members to congregate for recreational activities or community meetings. A cemetery will allow Chapter members continual connections to their homeland (WHP 2008e, pg. 3-2).

Infrastructure within the community will be improved, particularly within the FBFA, to provide water and electricity to all residents. The water table will be surveyed. Solid waste will be collected safely and reliably at a Chapter transfer station. Improved cellular communications infrastructure will improve quality of life and safety for all residents (WHP 2008e, pg. 3-2).

Economic development will improve quality of life for the Chapter. Retail and recreational opportunities for tourists will improve the local economic base. An RV park with all amenities and a restaurant will attract travelers (WHP 2008e, pg. 3-2).

Better transportation infrastructure will provide safe and adequate public access to and within the community and support the movement of goods and services throughout the region. The most heavily traveled roads will be paved and a fee will be charged to travel on them. The road system will be improved and maintained to be safe and efficient in all weather conditions and seasons (WHP 2008e, pg. 3-2).

Nearby emergency health, fire, and police facilities and substations will provide a quick response to medical and safety emergencies. Helicopter service to Tuba City will respond to major emergencies. All homes will be assigned addresses for emergency response and will be within range of reliable cell phone service. The health, fire, and police services will be connected by an efficient and reliable communications system (WHP 2008e, pg. 3-2).

Ranching, farming, and raising grazing animals will continue to be a rich and viable way of life in this part of the Navajo Nation. A nearby ranger station will help to manage rangelands and

prevent criminal activities such as theft of livestock. A range management plan and windmill will help preserve the quality of the land and maintain this means of subsistence. A Humane Society will care for malnourished animals. Ranchers will have a nearby feed store for livestock. Farms will be located near individual scattered homesites (WHP 2008e, pg. 3-2).

Community facilities and parks will provide places for Chapter members to congregate. Picnic grounds and development of Antelope, Mormon, and "The Cut" trail will allow tourists and residents alike to appreciate the beauty of the land (WHP 2008e, pg. 3-2).

Coppermine Chapter Obstacles

Obstacles

The Coppermine Chapter has identified development obstacles and formulated possible solutions to surpass or avoid them;

Funding is limited and difficult to obtain from the Navajo Nation, Western Navajo Agency, and other funding sources, but funds are needed to build facilities and make improvements. Every chapter is competing for the same limited funds. The chapter with a dedicated committee that has effective leadership and advocates their chapter's projects obtains the most resources (WHP 2008e, pg. 3-3).

Much of the planned development will require land to be withdrawn from the current grazing user. Grazing-permit holders want compensation for land withdrawn from their use and have a right to appeal the land withdrawal process. The process of land withdrawal is a difficult political process (WHP 2008e, pg. 3-3).

The Chapter has had difficulties in following through with community development ideas provided within the previous land use plans. The Chapter cannot complete projects because the process to withdraw land is cumbersome and restrictive and prevents progress (WHP 2008e, pg. 3-3).

A lack of qualified personnel with planning and construction experience in the Chapter has created problems with some services. The Chapter has not been able to fill planning positions because there is limited training available for Chapter members, and it is difficult to attract qualified personnel (WHP 2008e, pg. 3-3).

The Chapter has had difficulty completing projects because of a lack of funding. According to Chapter residents report that the high cost of construction, limited Chapter funds, and widespread funding shortfalls at the Nation level have led to very little funding for the Chapter (WHP 2008e, pg. 3-3).

When the Chapter does receive funding, projects are funded in a piecemeal manner, resulting in many projects without enough funding. There is no business plan that prioritizes community

projects and establishes a process of what needs to be done, such as withdrawing land for development. Many of the funds given by the federal government have an expiration date. Since the government often only provides a small fraction of funding to a project, the expiration date passes before the Chapter can collect the remainder of funds. Very little tribal funding trickles down to the Chapter to complete projects, and the State of Arizona will not fund projects on tribal land (WHP 2008e, pg. 3-4).

Strategies around the Obstacles

The following categories represent strategic directions the Chapter can take in addressing the obstacles summarized above in order to achieve the community vision (WHP 2008e, pg. 3-4).

Chapter members identified a need to establish a community outreach program. The program would increase community participation and educate community members in how to develop and follow through with goals and objectives presented in the CLUP. In addition, the program would build partnership with other chapters, the Navajo Nation, and other government entities (WHP 2008e, pg. 3-4).

The Chapter needs to develop and adopt a Community Strategic Plan that defines the problems, has long- and short-range goals, and prioritizes projects. The performance of the Chapter should be based on measurable goals, qualitative and quantitative research, and use of the most current practices to obtain the best result. The CLUP should ensure that annual project and plan evaluations are completed, that proposals are submitted in a timely manner, and that financial resources are secured (WHP 2008e, pg. 3-4).

A financial plan is needed to determine the amount of resources needed to address these needs and how resources will be allocated. It will also determine the amount of resources allowed to employ a grant writer and planner to help facilitate this community development process and secure funds from the FBFA Recovery Plan (WHP 2008e, pg. 3-4).

Culturally and religiously specific social and mental health counseling needs to be provided for Chapter members. This type of counseling should respect the needs and beliefs of the community.

Public participation is an important component of the government decision-making process, but the public needs to be reassured that government decisions are impartial, timely, and fair. Chapter members feel that the project approval process is lengthy and unreliable (WHP 2008e, pg. 3-5).

Protecting and reviving culture is important to people in the Chapter. Over the years, language and cultural ways have been lost. Cross-cultural and cross-generational mentoring will help tribal members share their cultural experience and knowledge. The Chapter needs to promote the preservation of the Navajo language by encouraging bilingual education and conversation.

Chapter members also need to take responsibility for knowing the legal practices and process that govern the actions and responsibilities of individuals (WHP 2008e, pg. 3-5).

Resource Needs

Community Resource Needs were identified and divided into the following areas;

- Infrastructure/Utility
- Transportation
- Housing
- Health and Public Safety
- Community Facilities
- Economic Development
- Education
- Open Space, AOA, and Grazing

Coppermine Chapter Priority Capital Improvement Projects

These needs are fully outlined in the 2008 Coppermine CLUP (WHP 2008f). Once these resource needs were identified, the Chapter voted on which actions/projects should be addressed first through a vote. The top five projects the residents would like to see occur first consists of nine projects due to several tied votes. The top projects include a pavement and improvement of Road N20 (28 miles), construction of homes on individual homesites within FBFA, a waterline toward Kaibeto West, South, and East, a 3-Phase Power line (West, South, Northeast), and a cell tower (WHP 2008e, pg. 3-10).

Coppermine Chapter Priority Project Phasing

This section outlines the phasing of the projects that received the most individual votes from Chapter residents at the community workshops. Phase 1 would be constructed in 5 years or less, Phase 2 would be constructed in 5-10 years, and Phase 3 projects would not be complete for another 10-15 years (WHP 2008e, pg. 3-12).

Phase 1 Projects: 1-5 Years

The following represent the projects identified as part of Phase 1 Developments by the voting groups. These are considered the items most urgently needed by Chapter residents (WHP 2008e, pg. 3-11):

Public Safety

- Ambulance
- Fire station
- Police station

- Communications system
- Rural addressing
- Addressing transition back to community of origin
- Improving governance
- FBFA money going directly to FBFA priorities

Health

- 8 acres for clinic
- Senior citizen
- Pharmacy
- Addressing trauma due to FBFA
- Care for disabled citizens
- Women's shelter – near Gap school
- Behavioral health – near Gap school
- Veterans facility

Community Facilities

- Telephone/Landline
- Cemetery
- Waste transfer station

Infrastructure Utilities

- Wind Power
- 3-Phase power line West, South, North, and East
- FBFA waterline toward Kaibeto West, South, and East
- Define water table and source
- Windmill – water for livestock
- Cell tower
- Solar power – to individual homes that are a distance from powerline – in all of the Chapter area
- Domestic water at feasibility stage – West and South of Chapter area
- Regional water pipeline from Lake Powell

Transportation

- Road N20 (28 miles)
- Road N21 (Gap to Kaibeto)
- School bus routes
- Public safety

Open Space, Cultural Sites, and Grazing

- Solid waste cleanup (old Trading Post area)
- Preservation at identified sites
- Coppermine Trading Post – historical preservation
- Livestock facilities (branding corrals, etc.)

Housing

- Homes on individual homesites in the FBFA

Education

- On-line education

Phase 2 Projects: 5-10 Years

These are projects that realistically will take 5-10 years to get on the ground (WHP 2008e, pg. 3-12):

Public Safety

- Medic Helipad/airstrip by Gap school

Health

- Nursing/Elderly home – near Gap school

Economic Development

- Vendor market by old Trading Post
- Flea market
- Rest area by old Trading Post

Agricultural Development

- 1st Windmill

Transportation

- I.R. 201 pavement
- I.R. 6210 pavement

Open Space, Cultural Sites, and Grazing

- Farm near individual homes
- Develop wells, water for irrigation

Housing

- Clustered housing (Gap)

Phase Projects: 10-15 Years

The following represents the project identified by one small group as part of Phase 3 Developments. This project should be considered part of future efforts to expand economic development opportunities for local residents, including providing additional jobs and adding on to existing livestock management knowledge and expertise (WHP 2008e, pg. 3-13, 3-14):

Community Facilities

- Boys & Girls Club/Youth Center by Chapter's Multi-Purpose building
- Multi-Purpose building
- Head Start facility
- Senior Citizen Center
- Cultural Center
- Veteran Center – by Chapter House
- Post Office – by Chapter House

Infrastructure Utilities

- Natural gas line

Economic Development

- Grocery
- Laundromat
- Business park
- Truck stop
- Garage/Gas station
- Visitor Center
- Storage
- Livestock Feed Store
- RV Park w/all amenities
- Eatery
- Rodeo grounds/Sports complex center
- Casino

Transportation

- Toll road
- Elderly shuttle
- Future Interstate through Coppermine

Open Space, Cultural Sites, and Grazing

- Wildlife preservation (Cedar Tree Hills & Mormon Ridges)
- Preservation of old trails – Lee's Ferry and Marble Canyon
- Preservation of old trails – the Great Western Trails

Housing

- Nursing Home (Gap-Habitin)
- Rental units with clustered housing
- Clustered housing units – near Chapter House
- Clustered housing units – by old Trading Post

Education

- Charter school (grades 8-12)
- GED program
- Skill Center and Life Skill training center
- Cultural training center (weaving, others) by Chapter House

Parks and Recreation

- Antelope Trail development
- "The Cut" horse trail development
- Mormon trail (Echo Cliffs)
- Hiking and backpacking trails
- Guided Tours (ATVs)
- Visitor Center

Preferred Development Sites

The Chapter identified four areas as ideal locations for future residential development (WHP 2008e, pg. 3-15):

Residential and Commercial Development

The first development site is located in the southern portion of the Coppermine planning area, near Windmill 1. It is accessible by N-20, an unpaved road. This land status Navajo Tribal Trust and is currently used as grazing land. The Chapter plans to use this site for future clustered housing developments (WHP 2008e, pg. 3-16). The soil is suitable for building, it is located in a low sensitivity area Resource Protection Zone, and there are no recorded cultural resources (although due to the site density in the area, it is expected cultural resources may need to be mitigated at this site).

Development site 2 is located by Windmill 4, west of ISR #20. The land status Navajo Tribal Trust and is currently used as grazing land. The Chapter plans to develop this land for residential and commercial uses in the future. The soil is suitable for building, it is located in a low

sensitivity area Resource Protection Zone, and there are no recorded cultural resources (WHP 2008e, pg. 3-17).

Development site 3 is located next to the former trading post. The land status Navajo Tribal Trust and is currently used as grazing land. The Chapter plans to develop this land to accommodate grazing and residential development in the future. The soil is suitable for building, it is located in a low sensitivity area Resource Protection Zone, and there are no recorded cultural resources (WHP 2008e, pg. 3-18).

Development site 4 is located at the northern end of the Coppermine planning area. The land status is Navajo Tribal Trust and is currently used as grazing land. The Chapter plans to develop this land to accommodate grazing and residential development in the future (WHP 2008e, pg. 3-19). The soil is suitable for building, it is located in a low sensitivity area Resource Protection Zone, and there are no recorded cultural resources (although due to the site density in the area, it is expected cultural resources may need to be mitigated at this site).

2.7.5 Kaibeto Chapter

The Chapter is bordered by Lechee, Shonto, Tonalea, and Tuba City Chapters. The name Kaibeto derives from the Navajo word *K'ai'bii to'*, which means "willow in the water." The Chapter consists of the community of Kaibeto, rangeland, and open space. The community of Kaibeto started as a trading post in 1914. A Bureau of Indian Affairs (BIA) school was later built near the community.

The Chapter House was built in 1955, and another BIA school was built after the Chapter House. In the 1970s and 1980s, two NHA subdivisions, several churches, and one clinic were built. Kaibeto's community center consists of three residential subdivisions, scattered-clustered housing, a grocery store, school, warehouse, Chapter House, laundry facility, several churches, sewer lagoons, and an abandoned airstrip.

With the exception of one main paved road, the roads within this central area are all dirt or gravel roads. Some homes are located in the rangeland and tend to be owned by cattle or sheep ranchers. For the most part, utilities have not been extended to these scattered home sites, unless those homes are located along major roads with utilities (WHP 2008f, pg. 1-5).

Kaibeto Chapter Physical Setting

Kaibeto Chapter is located in northern Arizona near the northern boundary of the Navajo Nation. The size of the Chapter is approximately 237,338 acres. Kaibeto Chapter lies on the Kaibeto Plateau, northwest of Black Mesa. Elevations in this area range from 6,880 feet on White Mesa to 5,700 feet near the community of Kaibeto (WHP 2008f, pg. 1-5).

The area is comprised of gently rolling topography, steep hillsides, rocky ridges, and deep canyons. The vegetation is chiefly piñon and juniper, mixed with grass. The area is drained by Kaibeto Creek, which flows northward toward Lake Powell about 20 miles to the northwest. Geologic rock units exposed in this area primarily consist of the Navajo Sandstone, which is underlain by the Kayenta and Chinle Formations (WHP 2008f, pg. 1-5).

Kaibeto Chapter Land Status

The Chapter is comprised of trust land with no private holdings. The southern portion of Kaibeto Chapter is located in the FBFA (WHP 2008f, pg. 2-31). The Kaibeto CLUP does not contain any information regarding land disputes within its border.

Kaibeto Chapter Land Use

The majority of the Chapter's land is used for grazing cattle and sheep (WHP 2008f, pg. 1-5). Kaibeto is located within Grazing District 1 and Sub-Unit 2. Ranger stations to patrol grazing land within the Chapter are located at a distance of at least 155 miles away, in Chinle and Shiprock.

The lack of ranger stations within the Chapter has resulted in insufficient range enforcement. There is also a lack of range preservation programs and public education in the Chapter. The lack

of an adopted range management plan has resulted in deteriorating conditions. Overgrazing has caused increased soil erosion and inadequate vegetation for livestock. Most grazing areas are not clearly identified or fenced. This has resulted in loose cattle that damage cultural sites, invade homesites, and cause irreversible damage to environmentally and culturally sensitive areas such as steep slopes, riparian corridors, and AOA.

Kaibeto Chapter Population and Housing

The 2010 US Census lists the Chapter population as 1,963 individuals. The Chapter has one community where most tribal members reside, Kaibeto.

The number of housing units in the Chapter is 531. The majority of homes are owner-occupied, and approximately a quarter of homes are vacant. The majority of homes in the Chapter are single detached homes (57%). The Chapter has a higher rate of detached homes than the Navajo Nation (WHP 2008f, pg. 2-8).

Kaibeto currently has three residential subdivisions near the central community area and many scattered site homes in more remote areas. Many of the homes in the Chapter are of poor construction quality, and many in the FBFA have become very run-down due to the restrictions on improvements. According to field data conducted by WHPacific in 2008, 53 percent of homes in the Chapter are in poor to very poor condition (WHP 2008f, pg. 2-9).

Many of the homes in the Chapter are located on scattered home sites and are owned by ranchers. Unless these homes are located near a main road, most have not been connected to utilities (WHP 2008f, pg. 2-9).

Kaibeto Chapter Government and Utility Infrastructure

The Chapter House was built in 1955, but it is inadequate for use as a community gathering space. The Chapter has withdrawn land near the junction at State Road 98 for a warehouse tract and a youth/activity center. They have also withdrawn land, now under the clearance phase, for a multipurpose building.

The Chapter has not had enough funding to provide a support staff, and they do not have personnel to coordinate community functions. The Chapter has been working on planning efforts, but it has had to hire consultants because it feels no qualified personnel are employed at the local government level to produce plans. In addition, the lack of office space and modern office equipment inhibits the ability to add needed employees (WHP 2008f, pg. 2-14).

The current infrastructure for Kaibeto Chapter includes water, wastewater, electricity, telecommunications, natural gas, and road systems. These systems are generally available to developed areas of the Chapter and limited to areas on the outskirts of the community (WHP 2008f, pg. 2-40).

Wastewater is handled through sewer lagoon systems or septic tanks. The Kaibeto School complex, the two Navajo Housing Authority (NHA) subdivisions, and the Chapter House complex discharge their wastewater to a sewer lagoon located west of the Chapter House. In 2003, under a project funded by the Environmental Protection Agency, Indian Health Service (IHS) added two new cells to the existing three-cell lagoon system. This system is currently at capacity. When new homes and businesses are built or existing home connected to the public wastewater system in Kaibeto, additional capacity will need to be added. According to the 2000 U.S. Census, 42 percent of homes in the Chapter do not have complete indoor plumbing facilities (WHP 2008f, pg. 2-45).

Forty-four percent of the homes in the Chapter use septic systems to handle wastewater (WHP 2008f, pg. 2-45). While septic systems sometimes pose environmental risks, particularly to the water table, in higher-density residential areas and areas with a high water table, meaning groundwater is close to the surface and therefore at high risk for contamination from septic tanks, the issue with septic tanks in Kaibeto is more due to the remoteness of residences (WHP 2008f, pg. 2-45).

Septic tanks require occasional servicing to empty the tanks and flush the lines. The remoteness of many scattered site homes means that these services cost more than they would to service areas easier to reach and closer to Page or Flagstaff, where private service companies are located. Many residents of these remote homes subsist on ranching and may not have the additional cash to pay for septic tank servicing, no matter how much the service costs. As a result, many septic systems are abandoned once the tank is full, and residents resort to using outhouses or simply letting sewage pool and evaporate naturally, which poses a human health risk. Addressing this issue will require policy decisions and perhaps new programs to either provide financial assistance to cover the cost to service septic tanks or to provide public services to empty septic tanks, which will also necessitate constructing a facility where collected waste can be safely treated (WHP 2008f, pg. 2-45).

Electric utilities are built and maintained by the Navajo Tribal Utility Authority (NTUA) for most areas of the Navajo Nation. The main transmission line runs parallel to Route 15. Few or no upgrades to the power system would be necessary, unless the load or demand for the proposed housing subdivision exceeds the available supply. This appears unlikely for a small subdivision. A feasibility study will be requested by the Kaibeto Chapter to NTUA to determine any necessary upgrades to the electrical system (WHP 2008f, pg. 2-47).

Natural gas lines are available to the existing NHA subdivision, and therefore, presumably, gas would be available for future development (WHP 2008f, pg. 2-49). Eighty-seven percent of homes in the Chapter are dependent on bottled, tank, or liquid petroleum (LP) gas and wood sources of heating fuel (WHP 2008f, pg. 2-9).

The majority of Chapter members (63 percent) do not have telephone service available (WHP 2008f, pg. 2-10). Telephone lines are available only to the Chapter House and the NHA subdivision. There are seven pay phones in the community. There are no plans underway to expand these lines at this time. The Kaibeto Chapter provides three computers for public use at the Chapter House (WHP 2008f, pg. 2-49).

The Chapter has withdrawn one acre for a waste transfer station. Currently, trash collects in various areas of the Chapter, causing health hazards for residents (WHP 2008f, pg. 2-49).

Many families rely on individual wells for drinking water. Water hauling is common practice and can be difficult for some families, particularly the elderly, as it requires significant time and effort. The current water system in Kaibeto Chapter was designed and constructed by IHS. It is currently owned and operated by NTUA. The water source stems from two wells that penetrate the N-aquifer. The available water from these wells has reached its current capacity. Any future developments will require either these wells to be deepened or another well sunk (WHP 2008f, pg. 2-40).

The Chapter has installed two new waterlines that serve portions of the Chapter residing in the FBFA; a waterline through Mormon Ridge and a waterline to Mann's Mesa (WHP 2008f, pg. 2-43).

There are about five livestock windmills in the FBFA of the Chapter (WHP 2008f, pg. 2-44).

Kaibeto Chapter Environmental Safety Status

Due to the remoteness of some scattered site housing, there is an ongoing issue of people drinking water from windmills, which are at risk for bacterial contamination and air-borne contaminants, due to the presence of livestock, and vandalism, due to their remote, unsupervised locations. This issue can be addressed through providing safe drinking water sources closer to these remote homes; a centralized drinking water truck delivery system; and/or improving the water quality testing and treatment of all water sources, including windmills and earthen dams, which will require significant coordination with the relevant existing agencies and departments to expand their role and responsibility in this area (WHP 2008f, pg. 2-43).

Kaibeto Chapter Water

Surface Water

The Kaibeto Chapter is drained by the Kaibeto Creek, which flows northwesterly toward Navajo Creek and into Lake Powell. Kaibeto Creek contains a number of tributaries that drain the north and northwest sides of White Mesa. The Kaibeto Creek is ephemeral, meaning that it generally flows in response to seasonal precipitation events and snowmelt, but most of the year it is a dry creek (WHP 2008f, pg. 2-36).

Ground Water

Groundwater in this area is found in the Navajo Aquifer (N-aquifer). According to information received from the Navajo Nation Water Resource Management Branch there are wells that tap this aquifer which range from 600 feet to 1,360 feet deep. This aquifer is a valuable source of domestic water supply for this community and other communities in this region (WHP 2008f, pg. 2-40).

The Navajo Aquifer

The quality of the water within this system is excellent. The Lukachukai member of the Wingate Sandstone, the Moenave Formation, the Kayenta Formation, and the Navajo Sandstone comprise what is referred to as the N-aquifer. The Lukachukai Member consists of a fine to very fine-grained quartz sandstone that is homogeneous throughout the region. The Moenave Formation consists of two sandstone members that include Dinosaur Canyon and the Springdale Members. These consist of coarse- to very-fine-grained quartz sandstone with a large percentage of silt and firm calcareous cement (WHP 2008f, pg. 2-35).

The Kayenta Formation consists of a sandstone facies and a silt facies; the form is bonded with calcareous cement. The Navajo Sandstone is composed of medium- to fine-grained quartz sandstone and is bodied with weak calcareous cement. The sandstone contains many lenticular beds of cherty limestone. Because of their homogenous lithologies and loose cementation, the Navajo Sandstone and Lukachukai Member of the Wingate Sandstone are the primary water-producing units in the N-aquifer system.

Wetlands and Floodplains

Historical surface water flow data is not available for most of the FBFA, nor are flood plain maps. There are no recorded wetlands in the Chapter (US Fish and Wildlife Service 2016). Flood plain boundaries have not been determined by federal, state, or tribal entities. An inquiry with the Federal Emergency Management Agency in 2016 revealed that the Flood Insurance Rate Map (FIRM) for the unincorporated areas surrounding Kaibeto, Arizona, dated September 3, 2010, showed no flood prone areas (FEMA 2016).

Water Rights

Water rights are only mentioned in the CLUP at a regional level, not as a Chapter level project (WHP 2008f, pg. 4-21).

Chapter Water Needs

According to field data collected by WHPacific in 2008, forty-four percent of homes in the Chapter use septic systems and 28 percent use outhouses. The lack of wastewater infrastructure in the Chapter explains the high occurrence of septic systems and outhouses (WHP 2008f, pg. 2-45).

Many scattered-site homes are not connected to municipal water systems due to their remoteness and cost and the inefficiency of extending these systems to isolated locations. At the same time,

the Chapter's vision includes each home having adequate plumbing and access to safe water for drinking and domestic use. Those homes located close to existing water systems should be hooked up. Those too far from existing systems should be retrofitted for plumbing and provided nearby watering points where safe water for drinking and domestic use can be collected and hauled (WHP 2008f, pg. 3-3).

Kaibeto Agricultural Resources

Community Farmers

Kaibeto residents consider traditional, community farming of crops such as corn, squash, and beans very important to their way of life. Most of the agriculture that occurs within this Chapter, and the majority of the Navajo Nation, is defined by small family farms sized between 0.1–9.0 acres (US Census of Agriculture 2014).

In order to perpetuate the type of farming traditional to the Navajo, Chapter members would like to cultivate small farms to produce food for Chapter members. This type of community-based agriculture would help preserve the way of life for Chapter members, stimulate commerce within the Chapter, and enhance the sustainability of the community (WHP 2008f, pg. 3-15).

Kaibeto Soils

Chapter soils are part of the Sheppard-Fruitland-Rock Outcrop Association except along Kaibeto Creek where the soils are part of the Torriorthents-Camborthids-Rock Outcrop Association. The Sheppard-Fruitland-Rock Outcrop Association consists of somewhat excessively drained and well-drained soils and rock outcrop on plains and plateaus. The plains are broken by prominent mesas, buttes, and escarpments. Steep, rock-walled canyons form the sides of the drainages that traverse the areas. The soils formed in aeolian sandy material weathered from sandstone and shale (WHP 2008f, pg. 2-38).

Sheppard soils make up about 35 percent of the association, Fruitland soils 35 percent, rock outcrop about 15 percent, and minor areas of associated soils and dune land and Badland about 15 percent. The minor soils are mostly small areas of Moenkopie, Shalet, and Palma. The dune land occurs as scattered areas of low, poorly stabilized dunes of eroded shaly materials. These soils pose few limitations for potential homesite development. The sandy texture of the Sheppard soils is a severe limitation to shallow excavations (WHP 2008f, pg. 2-38).

The Torriorthents-Camborthids-Rock Outcrop Association consists primarily of the Grand Canyon area and the major tributaries to the Colorado River. These are shallow and moderately deep, moderately sloping to extremely steep, gravelly, cobbly and stony, moderately coarse to fine-textured soils developed in colluvial and residual materials such as limestone, sandstone, and shale bedrock (WHP 2008f, pg. 2-38).

Torriorthents make up about 65 percent of this association, Camborthids about 15 percent, and rock outcrop about 15 percent. About five percent of the mapping unit is Ustorthents, recent

alluvial soils along the tributary drainage ways and the Colorado River, very steep talus materials, and water, including the Colorado River and the Arizona portions of Lake Mead and Lake Powell (WHP 2008f, pg. 2-38).

Land Suitability sites for development were identified in the Kaibeto CLUP 2008, and the Chapter should continue to consider soil profiles in regards to suitable development sites within the FBFA.

Kaibeto Biological Resources

Threatened and Endangered Species and Resource Protection Zones

Portions of the Chapter contain some sections classified by NNDFW as Resource Protection Zone 1, a highly-sensitive wildlife resource area. Within the Chapter, Area 1 incorporates the Little Colorado River, the Ad'ee Chii Cliffs, and Kaibeto. The Little Colorado River is protected with a buffer zone from thick riparian vegetation to protect the yellow-billed cuckoo and southwestern willow flycatcher. The remaining area within the Chapter is designated as Resource Protection Zone 3, which is considered a low sensitivity area. (WHP 2008f, pg. 2-39).

Kaibeto Mineral Resources

Minerals

No minerals indicated in Community Land Use Plan 2008.

Kaibeto Cultural and Traditional Resources

Cultural Resources

The NNHHPD has inventoried and mapped the locations of several archeological sites and previous project locations, but the entire chapter has not been inventoried. NNHHPD does not reveal the locations of sensitive cultural sites due to the potential for vandalism, robbery, and the need to protect privacy. Hence the specific locations of cultural sites are not identified on maps.

The Chapter has also identified AOA, as previously discussed in the Kaibeto Land Use section. The Navajo's traditional subsistence lifestyle includes using the land to gather a variety of plants/herbs for medicinal and ceremonial purposes and materials for arts and crafts. The areas that provide these resources are considered "areas of avoidance" – traditionally and culturally sensitive areas to be protected from development in perpetuity to preserve their historic significance or ongoing ceremonial use.

While these areas are well-known by many elders and traditional Navajo residents, the younger generation does not necessarily share this knowledge and understanding. There is currently a lively debate about whether these special areas should be mapped or not. Proponents say that mapping helps preserve and pass on this important cultural and spiritual knowledge across generations and into the future; opponents say this information should be passed orally and

personally from generation to generation. In either case, it is important for the Chapter to establish a policy and procedure for how to assure that lands planned for development are not areas to avoid. The Navajo Historic Preservation office does have maps of some of these areas, which it can check site by site as project proposals move forward for development (WHP 2008f, pp, 2-39).

Recently, the Chapter has noticed activities that threaten culturally sensitive areas and fragile environments. Four-wheelers have been driving uninhibited through Chapter lands, and tourists have been removing artifacts from Chapter land. These types of activities can do irreversible damage to culturally significant areas and environmentally sensitive areas and must be addressed in order to prevent them in the future (WHP 2008f, pp, 2-40).

Kaibeto Chapter Community Needs Assessment

The community needs assessment is based on information provided from the community workshops in 2008 that were hosted by WHPacific, Inc., comments provided by the community, and professional field assessments completed by WHPacific, Inc. in the summer of 2008 (WHP 2008f).

The community needs assessment includes Chapter Vision and Goals for the FBFA, resource needs, identification of specific actions and projects that need to be implemented in the FBFA, project phases by timeline, and preferred development sites within the Chapter.

Kaibeto Development Vision

The Chapter vision captures how Chapter members would like to see their community grow over the next 15 years. In the long-term, Chapter members want to maximize the benefits of modern opportunities, but at the same time maintain the integrity of traditional Navajo culture. Chapter residents want to preserve their rural atmosphere, but bring in modern amenities such as telephones, electricity, and plumbing to all residents who desire them (WHP 2008f, pg. 3-1).

The following statement reflects the Chapter's vision:

The people of Kaibeto are committed to preserving and enhancing the history, culture, heritage, natural resources, and scenic beauty of their environment. It is our belief that through unified local government leadership, utilizing community resources and maintaining family values, we will preserve choices and potential for future generations (WHP 2008f, pg. 3-1).

Kaibeto Development Goals

During the community workshops held during Summer 2008, community members outlined goals for the Chapter that would aid in reaching this vision. These goals include community policies, capital projects, and community service (WHP 2008f, pg. 3-1).

Community facilities and service are an important part of the community vision. The Chapter wishes to improve education, including expanding educational facilities for the Chapter's youth. A multi-purpose community center will provide a place for community members to congregate for recreational activities or community meetings. A community store will provide jobs and basic necessities for Chapter members and tourists (WHP 2008f, pg. 3-1). Chapter wishes to hire staff to provide additional chapter services and provide ongoing planning efforts in an expanded office space with updated office equipment (WHP 2008f, pg. 3-2).

Infrastructure within the community will be improved, particularly within the FBFA, to provide water and electricity to all residents. Solid waste will be collected safely and reliably at a Chapter transfer station. Improved cellular communications infrastructure will improve quality of life and safety for all residents (WHP 2008f, pg. 3-2).

Because of the high cost of providing municipal infrastructure to remote houses in the chapter, solar power with wind-powered back-up generators will be used to provide electricity to scattered rural homes. Rural homes will also have improved access to safe drinking water sources if the cost of connecting them to municipal services is too high. The Chapter will provide educational and training opportunities for residents and entrepreneurs to learn how to maintain these off-the-grid utilities (WHP 2008f, pg. 3-2).

Community facilities like a multipurpose center, schools, and an adult education center will provide computers and Internet access to support the curiosity, learning, and communication needs of all residents (WHP 2008f, pg. 3-2).

Economic development will improve quality of life for the Chapter and retail and recreational opportunities for tourists. Ranchers will have nearby water resources for livestock. Chapter vendors will be able to sell Navajo arts and jewelry to tourists. Affordable groceries will be available at a store within the Chapter (WHP 2008f, pg. 3-2).

Chapter residents will have a full range of education opportunities from school age through adulthood, including childcare, job training, leadership cultivation, culture and language sharing, and personal and business finance management (WHP 2008f, pg. 3-2).

The road system will be improved and maintained to be safe and efficient in all weather conditions and seasons (WHP 2008f, pg. 3-2).

Community facilities and parks will provide places for Chapter members to congregate. The existing rodeo facility is in poor condition and is not located on a main road. An improved and accessible rodeo ground will attract tourists and bring together residents of all ages (WHP 2008f, pg. 3-2).

Nearby emergency health, fire, and police facilities and substations will provide a quick response to medical and safety emergencies. Helicopter service to Tuba City can respond to major

emergencies. All homes will be addressed for emergency response and within range of reliable cell phone service (WHP 2008f, pg. 3-2).

Ranching and raising grazing animals continues to be a rich and viable way of life in this part of the Navajo Nation (WHP 2008f, pg. 3-2). A nearby ranger station will help to manage rangelands prevent criminal activities such as theft of livestock. Range management education programs will help preserve the quality of the land and maintain this means of subsistence (WHP 2008f, pg. 3-3).

All residents who wish to live in Kaibeto will have safe, durable, energy-efficient homes with access to electricity and safe drinking water, whether they are located near the center of the community or in remote areas. Residents will have a full range of housing options to support each stage of life and all financial circumstances. Chapter members will be able to live in scattered home sites if they are grazers who prefer to live a subsistence lifestyle or clustered housing developments if they prefer the amenities and infrastructure of a modern community. Mobile home parks and rental houses will be available for people who may need to move from the Chapter in the future or for people who are in immediate need of a home. Elderly living facilities will allow independence while also providing assistance with preparing food, social opportunities, and medical care (WHP 2008f, pg. 3-3).

Guiding Development Principles

Chapter members outlined principles that should be used to guide development and protect culturally and environmentally sensitive land over the next 15 years (WHP 2008f, pg. 3-8).

It is important for the Chapter to provide for people's basic needs such as power and water. The Chapter needs to plan for improving the overall health of its members. Public safety and emergency medical service need to be improved to better respond to emergency situations (WHP 2008f, pg. 3-8).

Sustainable construction should be required for all new buildings. These buildings should be energy-efficient and designed to last many generations. Structures should be designed to work with the land in order to provide passive solar energy to further reduce energy costs. These structures should provide optimal protection from the elements with high-quality insulation to better regulate indoor temperatures and raised floors to protect against flooding (WHP 2008f, pg. 3-8).

New developments should not harm the natural environment or negatively impact traditional ways of life. It is important to protect water quality and groundwater for future generations. Other natural resources such as mineral deposits should also be used wisely to ensure sustainability. Any cultural sites within the Chapter should also be preserved. New developments in the Chapter should incorporate community-supported agriculture to provide healthy local food to the community (WHP 2008f, pg. 3-8).

The Chapter needs to protect and provide scattered housing as an option for remote areas and ranchers. Fencing around homes and cornfields will help keep cattle away from property that is easily damaged. Grazing areas should be located where cattle can be easily watched. Grazing should be protected as an ongoing way of life for people in the Chapter. The Chapter must educate grazing-permit holders on better range management practices and work to enforce these practices to ensure that this way of life can remain sustainable (WHP 2008f, pg. 3-8).

The Chapter needs to plan for jobs for the large and growing young population. According to Chapter members during the workshops, many members have moved to other communities in order to find employment. Creating jobs within the Chapter is essential to keeping younger population within the Chapter, or at least providing that opportunity (WHP 2008f, pg. 3-9).

New housing subdivisions should be built near necessary resources. Housing clusters should be constructed in areas where water and electricity are already available. These housing development sites should also be located within easy reach of community amenities such as emergency access (WHP 2008f, pg. 3-9).

It is important for the community to plan ahead before proceeding with growth. The Chapter needs to protect natural resources such as water, wildlife, and cultural areas. Plans need to be created to handle the hazards of new industrial opportunities before committing to new operations (WHP 2008f, pg. 3-9).

The Chapter has designated a community planning area three miles across, east to west, and two miles long, north to south. The entire area has been surveyed. The Chapter expects to direct development to this community growth area. The area has complete sewer and power lines. The next phase is to complete streets radiating off the currently paved area, identifying rights of way, and obtaining clearance for streets. This type of advanced planning nicely illustrates the orderly and efficient development of the community over time (WHP 2008f, pg. 3-9).

Kaibeto Chapter Development Obstacles

The Kaibeto Chapter has identified development obstacles and formulated possible solutions to surpass or avoid them. Some of the obstacle the Chapter sees are non-consent by land users and restrictive stipulations communication, insufficient development to entice/attract career people, inaccessibility of infrastructure and resources, loss of culture and language, lack of progress in community development, neglected community security and safety, and the feeling the Chapter has been disrespected as impacted people (WHP 2008f, pg. 3-3, 3-4, 3-5).

Kaibeto Chapter Strategic Directions

In order to surpass these development obstacles, the Chapter has identified strategic directions for each obstacle. For improved communication, the Chapter can improve visual presentations, such as PowerPoint presentations and can engage an audience much better with strong graphic aides. Mailings to individual Chapter members and radio announcements would inform Chapter members of upcoming meetings. Meals provided during public meetings would draw members

to a meeting during lunch or dinner hours. Bilingual presentations are more inclusive for all members (WHP 2008f, pg. 3-5). By scheduling public meetings on weekends, more Chapter members will be able to attend community meetings because fewer members will be at work.

Newsletters sent to Chapter members will inform them of current events and upcoming meetings. Expanded use of the Internet can help the Chapter reach members who are not able to attend community meetings and will allow for feedback beyond the timeframe provided by a meeting. Email and regular mailings should be used to remind members of upcoming elections. It is important to encourage and reward Chapter members to participate in the public process (WHP 2008f, pg. 3-6).

To help stop the loss of culture, the Chapter needs to coordinate with appropriate departments to help locate and preserve historical sites. All sacred, culturally important, and historic sites need to be inventoried, even if they are not maintained on a map (WHP 2008f, pg. 3-6).

The Chapter should engage in a public education and awareness campaign about these sites. Each of the sites should be inventoried and archaeologically evaluated. Regulations for these preservation areas need to be established. Regulations for off-road vehicle use around these sites need to be established and enforced, providing a designated area or areas for ATV use. Eventually, the Chapter needs to decide as a community how to pass knowledge of and responsibility for these sites from elders to younger generations (WHP 2008f, pg. 3-6).

To help stop the loss of language, cross-cultural and cross-generational mentoring will help tribal members share their cultural experience and knowledge. The Chapter needs to promote the preservation of the Navajo language by encouraging bilingual education and conversation. The Chapter also needs to encourage Ké, Navajo common law, which is a gesture of Navajos respecting one another and placing Navajo customs and beliefs above government rules (WHP 2008f, pg. 3-6).

To improve workforce development, the Chapter could provide cardiopulmonary resuscitation (CPR) and food handler training, which are essential to the hospitality industry. Scenic views and the close proximity to the Grand Canyon provide the Kaibeto Chapter with potential for growth in the hospitality service industry (WHP 2008f, pg. 3-6).

Satellite continuing education courses from nearby vocational schools could further provide training for the local workforce. In addition, this vocational training could be incorporated into the local high school curriculum to provide the Chapter's youth with the skills necessary for holding quality jobs on the reservation (WHP 2008f, pg. 3-6).

Possibly the most important part of enhancing the workforce and maintaining qualified employees in the Chapter is to provide competitive salaries. It is not uncommon for Navajo Nation residents to seek higher-paying employment in nearby off-reservation communities. Seeking private grants or establishing relationships with private funders may provide the

resources for recruitment efforts that include a guaranteed salary or scholarships in exchange for a commitment of particular years of service within the community (WHP 2008f, pg. 3-7).

For improved infrastructure, the Chapter could purchase a road grader for dirt roads. Culverts need to be installed and regularly cleared of silt and debris in places where the roadway commonly washes out. Main roads such as the road that connects to Coppermine Road should be paved. The Chapter also needs to plan for road infrastructure in the Chapter. Roads to individual homes need to be upgraded in order to improve access and prevent unnecessary soil erosion, particularly to and from remote homes. Farm and highway fencing will keep livestock out of harm's way and away from environmentally sensitive areas (WHP 2008f, pg. 3-7).

Windmills for livestock are also needed to help ranchers with a reliable source of water for livestock. Wells and water storage tanks are needed to provide a tested and clean water supply for remote houses that have to haul water (WHP 2008f, pg. 3-7).

The Chapter has expressed an interest in the use of solar infrastructure. Off-the-grid infrastructure like solar power can be used to provide utilities to scattered home sites that are far away from municipal infrastructure (WHP 2008f, pg. 3-7).

Empowering local governance within the Chapter was identified as a priority in the community workshops. The Chapter needs to hire personnel to support local government. The Chapter desires to hire Chapter members to staff new Chapter government positions. In order to begin hiring for these positions, the Chapters needs to develop job descriptions for both a Community Services Coordinator and all other Chapter positions. Ongoing training in leadership, financial management, public financial management, public service, and project management will build community development and local governance at the Chapter level (WHP 2008f, pg. 3-7).

The Chapter also wishes to acquire Local Governance Act (LGA) certification. LGA certification recognizes governance at the local level by granting local authority over local matters. After updating and adopting this CLUP 2008, the Chapter must continue training in financial management as the next step in certification (WHP 2008f, pg. 3-7).

Forming a central contact person will help the Chapter reach its vision and obtain leadership commitment and support for FBFA priorities. This central contact person will help establish cooperative and collaborative relationships and help Chapter members ensure that the FBFA projects get completed (WHP 2008f, pg. 3-8).

A policy for helping displaced residents return after the former Bennett Freeze needs to be established. An orderly process for obtaining home site leases needs to be created to help residents acquire a home in a timely manner. Utilities and other infrastructure need to be improved for residents returning to the FBFA. Counseling and support services for FBFA victims also needs to be provided. The Chapter should continue to work with the FBFA Task

Force and Design and Engineering Services to establish fair policies and procedures and ensure the delivery of services and infrastructure to FBFA residents (WHP 2008f, pg. 3-8).

Kaibeto Chapter Community Needs

Community Resource Needs were identified and divided into the following areas:

- Infrastructure/Utility
- Transportation
- Housing
- Health and Public Safety
- Community Facilities
- Economic Development
- Education
- Open Space, AOA, and Grazing

Infrastructure

Infrastructure within the community needs improvement. Chapter lands within the former Bennett Freeze boundary are most in need of repair because funding for improvements was frozen for over 40 years. The Chapter has noted a need to improve the water and electricity infrastructure in the FBFA (WHP 2008f, pg. 3-9).

Currently the Chapter is working on the main power lines to homes in the FBFA, but the means of connecting each individual home to the power system has not been worked out. New sewer lagoons will have to be constructed for new clustered residential developments (WHP 2008f, pg. 3-9).

Some rural Chapter members do not have cell phone service or other telecommunications service to their homes. People have to drive to locations where cell phone service is available in order to make a phone call, a major inconvenience and huge safety issue in emergencies, as it adds time to emergency response. In addition to spotty cellular communications, Internet access is also sparse but could be provided easily in designated areas with wireless service (WHP 2008f, pg. 3-10).

Transportation

Poor road conditions are common throughout the Kaibeto Chapter. According to Chapter members who attended the planning workshops, many roads are washed out after storms or when snowmelt crosses the road. The road that connects with Coppermine Road is heavily traveled but unpaved (WHP 2008f, pg. 3-11).

In order to maintain better roads in the Chapter, it could purchase a road grader to maintain dirt roads. Culverts need to be installed and regularly cleared of buildup in places where the roadway

commonly washes out. Roads to individual homes need to be improved in order to improve access and prevent unnecessary soil erosion (WHP 2008f, pg. 3-11).

During the workshops, Chapter members identified a need for an airstrip in the Chapter. Land has not been withdrawn, nor has a site been selected. Funds need to be set aside to study the feasibility of this airstrip (WHP 2008f, pg. 3-11).

Housing

At the planning workshops, participants identified the top need as housing, particularly in the FBFA. The Chapter members desire new homes constructed of long-lasting materials (WHP 2008f, pg. 3-11).

A diversity of housing types is needed within the Kaibeto Chapter. Elderly group homes are needed to house the aging population. In the past, many newly constructed homes were provided to elders, leaving young families still in need of housing. Clustered housing should be located in a central location, near municipal utilities, and other community amenities. There is also a need for mobile home sites, which are ideal for residents who do not have time to acquire a home site lease or might want to move elsewhere in the future (WHP 2008f, pg. 3-11).

The planning team analyzed the housing needs mentioned above and made a professional judgment about which projects will have the strongest benefits at the chapter level. Some projects mentioned above would benefit the entire region and are best funded at the regional level (WHP 2008f, pg. 3-11).

Health and Public Safety

Response time to emergencies throughout the Chapter is too long to assure public safety (WHP 2008f, pg. 3-12).

Chapter members have expressed a need for a police substation within the FBFA of the Chapter. The nearest emergency health facilities are in Page and Tuba City. A quick-responding helicopter medical emergency response unit is needed to provide expedited response to medical emergencies. Many homes within the Chapter do not have physical addresses. These homes need to be addressed in order to help emergency personnel locate a site (WHP 2008f, pg. 3-12).

As of 2008, the Navajo Nation has been working on a rural system for 911 emergency response. This project will map and assign an address to all homes in the Chapter (WHP 2008f, pg. 3-12).

Chapter members expressed a need for a local trauma center within the Kaibeto town site and a second satellite health clinic in the FBFA. A care center for the aging population is also needed (WHP 2008f, pg. 3-12).

The planning team analyzed the public safety and health needs mentioned above and made a professional judgment about which projects will have the strongest benefits at the Chapter level.

Some projects mentioned above would benefit the entire region and are best funded at the regional level (WHP 2008f, pg. 3-12).

Community Facilities, Parks, and Recreation Needs

Community facilities and services are an important part of the community vision. A senior citizens center is needed for the aging population in the Chapter, and a daycare is needed for children younger than pre-school age. A multipurpose community center will provide a place for community members to congregate for recreational activities or community members. Kaibeto also needs a cemetery within the Chapter (WHP 2008f, pg. 3-13).

Community recreation facilities will also be an important element in improving the quality of life for people in the FBFA. Community facilities provide a place for youth and adults alike to congregate. A skate park for teenagers and playground equipment for younger children are desired by the Chapter for youth. A Boys and Girls club would also provide activities for the Chapter youth. Chapter members also desire a recreation center, firing range, and improved and relocated rodeo grounds. These facilities will provide entertainment for Chapter members of all ages, as well as regional economic development opportunities as an activity center (WHP 2008f, pg. 3-13).

Economic Development

The Chapter needs an affordable grocery store and a self-service laundry service at the Kaibeto town site. Currently, Chapter members have to drive to either Page or Tuba City to get to the nearest grocery store and laundry service, which means spending more time in their automobiles and more money on fuel. A community store will provide jobs within the community and sell basic items for Chapter members and tourists (WHP 2008f, pg. 3-14).

The Chapter wishes to hire staff to provide additional chapter services and support ongoing planning efforts. Expanded office space and office equipment within the Chapter House is needed for any additional staff (WHP 2008f, pg. 3-14).

Many Chapter members make a living by selling Navajo arts and jewelry. Currently, vendors set up along State Road 98. There is not adequate right-of-way to provide a safe distance from moving traffic. The Chapter needs to designate a vending area removed from the right of way and withdraw land for this vendor village (WHP 2008f, pg. 3-14).

The Chapter has withdrawn several sites for economic development. A planning effort needs to be coordinated to make sure that these sites are successfully developed and are beneficial to the community (WHP 2008f, pg. 3-14).

Education

The Chapter wishes to improved education. Although there are numerous education opportunities for the school-age population, there are no educational services for adults and the population younger than kindergarten age. Adult and continuing education services are far from

the community (WHP 2008f, pg. 3-14). There are no pre-schools or childcare facilities near Kaibeto. The lack of facilities for the younger population can make finding childcare difficult for working families with young children (WHP 2008f, pg. 3-15).

The Chapter needs to secure funding for continuing education programs and pre-school programs. An educational needs assessment needs to be conducted in order to justify new schools within the Chapter. Suitable sites need to be identified and withdrawn for any new facility. The Chapter will have to coordinate with other government agencies to secure funding for new educational facilities and programs (WHP 2008f, pg. 3-15).

Open Space, "Areas of Avoidance," and Grazing Needs

Raising grazing animals is a way of life for people in the Chapter. Much of the land within the Chapter is leased to grazing-permit holders. Over time, poor range management has caused problems on grazing land. There is not a ranger station near the Chapter to patrol grazing land. Grazing animals have been reported to be stolen, and some permit holders have exceeded limits of livestock numbers. The Chapter needs to provide grazing areas that can be easily watched (WHP 2008f, pg. 3-15).

Poor range management has also resulted from the lack of land conservation programs and education. Much of the grazing land is not fenced, thus allowing grazing animals near homes, agriculture sites, and environmentally sensitive areas such as steep slopes. Range management education, increased range enforcement, and fencing are needed in order to allow grazing to continue within the Kaibeto Chapter (WHP 2008f, pg. 3-15).

Agriculture and farming are also important to the way of life for the people of the Kaibeto Chapter. In order to perpetuate the type of farming traditional to the Navajo, Chapter members could cultivate small farms to produce food for Chapter members (WHP 2008f, pg. 3-15). This type of community-based agriculture would help preserve the way of life for Chapter members, stimulate commerce within the Chapter, and enhance the sustainability of the community (WHP 2008f, pg. 3-16).

The desert landscape home to the Kaibeto Chapter is delicate. The Chapter needs to create programs to protect water quality, wildlife, and minerals in the area. During the community workshops, participants identified several "areas of avoidance". These areas need to be inventoried and perhaps mapped. If necessary, these sites should be fenced in order to keep grazing animals away from sites that could be damaged, and regularly patrolled to protect against vandalism and unsanctioned poaching (WHP 2008f, pg. 3-16).

Kaibeto Chapter Priority Capital Improvement Projects

These needs are fully outlined in the 2008 Kaibeto CLUP (WHP 2008f). Once these resource needs were identified, the Chapter voted on which actions/projects should be addressed first through a vote. The top projects the residents would like to see occur first include a power line

to FBFA (including connection to individual homes), a paved road to connect w/Coppermine Road, individual home sites and houses in FBFA, a communication tower, a police substation in FBFA, windmills for livestock, local ranger station, and a multipurpose center near Kaibeto Market, Kai'bii'to Land Site (WHP 2008f, pg. 3-17).

Kaibeto Chapter Priority Project Phasing

This section outlines the phasing of the projects that received the most individual votes from Chapter residents at the community workshops. Phase 1 would be constructed in 5 years or less, Phase 2 would be constructed in 5-10 years, and Phase 3 projects would not be complete for another 10-15 years (WHP 2008f, pg. 3-18).

Phase 1 Projects: 1-5 Years

The following represent the projects identified as part of Phase 1 Developments by the voting groups. These are considered the items most urgently needed by Chapter residents (WHP 2008f, pg. 3-18):

- Feed Store
- Clinic (Kaibeto area)
- Cellular tower
- Paved road to connect with Coppermine
- Roads to individual homes

Phase 2 Projects: 5-10 Years

These are projects that realistically will take 5-10 years to get on the ground (WHP 2008f, pg. 3-18):

- Public safety complex
- Multipurpose Center (near Kaibeto Market, Kai'bii'to Land Site)
- Clustered housing

Phase 3 Projects: 10-15 Years

The following represents the project identified by one small group as part of Phase 3 Developments. This project should be considered part of future efforts to expand economic development opportunities for local residents, including providing additional jobs and adding on to existing livestock management knowledge and expertise (WHP 2008f, pg. 3-18):

- Bottling company
- Beef and sheep shipping

Preferred Development Sites

The Chapter identified several areas as ideal locations for future development. Most of these potential development sites are located along US Highway 89 and US Highway 160 (WHP 2008f, pg. 4-20). Several potential development sites were identified at locations away from the business centers. These include locations suitable for wind power generation, agricultural development, and home based businesses. Agricultural projects are geared to on-site improvements, such as earthen dams to create livestock ponds, moveable and permanent fencing, and pasture improvements. These projects are dispersed throughout the Chapter and would benefit individual sites. The appropriate project might be designed as a program of technical and financial assistance (WHP 2008f, pg. 4-20).

2.7.6 Leupp Chapter

Leupp Chapter is located in north central Arizona in the southwestern corner of the Navajo Nation and in the eastern portion of Coconino County. The Chapter is about 295,876 acres and includes 38,029 acres within the FBFA. Thirteen percent of the Chapter is located within the FBFA (WHP 2008g, pg. 1-5).

The Birdsprings Chapter is located to the east of Leupp, Tolani Chapter to the northeast, and Cameron Chapter to the north. Wapatki National Park is adjacent to the west boundary, as is the Coconino National Forest (WHP 2008g, pg. 2-35).

Leupp Chapter Physical Setting

Several topographic features outline the landscape surrounding the Chapter. Newberry Mesa rises 300 feet above the Painted Desert. Just north of Newberry Mesa are Pottery Hill, Lii Haaditiih Hill, and Ward Terrace. Tloi Lechii Cliff and Dry Spring Well are just two miles west of Lii Hadditiih Hill (WHP 2008g, pg. 2-37).

The Little Colorado River comes in from the southeast and traverses the community to the northwest, bringing numerous features to the landscape such as Grand Falls, Dennebito Wash, Box Springs, and Stone House Wash. The region between the Little Colorado River and Newberry Mesa is flat (WHP 2008g, pg. 2-37).

From southwest of the Chapter, Canyon Diablo winds through the valley and intersects the Little Colorado River at Leupp. San Francisco Wash, Young‘s Canyon, and Padre Canyon are just northwest of Canyon Diablo, and Yellow Jacket Canyon is to the southwest. Overall elevations in the Chapter range between 4,700 and 5,600 feet above mean sea level (WHP 2008g, pg. 2-37).

Leupp Chapter Land Status

The Chapter is comprised of trust land with no private holdings. The northern portion of Leupp Chapter is located in the FBFA (WHP 2008g, pg. 2-35). Other than the area within the FBFA, the Leupp CLUP does not contain any information regarding land disputes within its border.

Leupp Chapter Land Use

The majority of the Chapter’s land is used for grazing cattle and sheep. Leupp is located within Grazing District 5 and Sub-Unit 3 (WHP 2008g, pg. 2-36).

Ranger stations to patrol grazing land within the Chapter are located at a distance of at least 125 miles away, in Chinle and Shiprock. The lack of ranger stations within the Chapter means that there is insufficient range enforcement within the Chapter. Many people with grazing leases fear that their livestock will be stolen due to these deficiencies (WHP 2008g, pg. 2-36).

There is a lack of range and livestock preservation programs in the Chapter. The lack of these programs has resulted in poor range and livestock management on behalf of grazing leaseholders. This has resulted in overgrazing, which causes increased soil erosion and

inadequate vegetation for livestock. In addition, most grazing areas are not identified or fenced. This can result in loose cattle that damage cultural sites, invade homesites, and cause irreversible damage to environmentally sensitive areas such as steep slopes and riparian corridors (WHP 2008g, pg. 2-36).

Every year during the first part of October, the Leupp Cattle Growers Association holds a livestock auction for Navajo ranchers. The auction attracts state buyers and provides positive economic stimulus for Navajo ranchers. However, there are not enough corrals or bullpens to hold all the animals during the auction or in other times of the year (WHP 2008g, pg. 2-36).

Due to drought conditions, water is limited, especially when determining how much water should be allocated to animals. Earthen dams and windmills are built to supply water to animals, but there are not enough of them to supply water to all animals adequately (WHP 2008g, pg. 2-37).

Leupp Chapter Population and Housing

The 2010 US Census lists the Chapter population as 1,611 individuals. The Chapter has one community where most tribal members reside, Leupp.

There are 1,605 housing units found in the Chapter, and seventy-two percent of the homes are occupied (WHP 2008g, pg. 2-8). A little over a quarter (28 percent) of the homes are vacant. The Chapter has a higher rate of detached homes than the Navajo Nation at seventy-four percent (WHP 2008g, pg. 2-8).

A substantial number of homes are located in the town of Leupp. Housing units in the town of Leupp are distributed across five housing tracts, one trailer park, and a few scattered homesites. The housing tracts are withdrawn areas held by the BIA or the NHA. The trailer park is privately owned, and the scattered homesite leases are held by private individuals (WHP 2008g, pg. 2-10).

Many of the homes in the Chapter are of poor construction quality, and many in the FBFA have become very run-down due to the restrictions on improvements. According to field data conducted by WHPacific in 2008, nineteen percent of homes in the Chapter are in poor to very poor condition (WHP 2008g, pg. 2-10).

Leupp Chapter Government and Utility Infrastructure

The Chapter provides services to Chapter members and the surrounding region through the administration of tribal, county, state, and federal programs. Programs are housed in different community facilities, but primarily in Leupp Community Center (LCC), which is located in the town of Leupp. The LCC is situated on 100 acres of tribally withdrawn land designated as an industrial park. Other programs are housed in several other Chapter buildings, office trailers, and warehouses located on 25 acres of tribally withdrawn land (WHP 2008g, pg. 2-19).

The Youth Center is open to the general public at no charge and contains a fitness center and computer lab. The fitness center has free weights, a treadmill, stationary bikes, and a variety of leg machines. The computer lab has a scanner, Internet access, word processing, children's programs, and art software; however, there is a higher demand for computers than there are computers available. The Youth Center also houses two youth programs. The Youth Opportunity Program is open to individuals between the ages of 14 and 21. The Office of Diné Youth (ODY) program is for two separate age groups, 14 and under, and 21 to-25 (WHP 2008g, pg. 2-19).

The Navajo Nation‘s Southwest Regional Office of the Department of Social Services and the Youth Program are housed in the same facility. The Department provides the following services: Adult In-Home Care, 638 Welfare Assistance, Child Protective Services, Family Preservation Service-Arizona Title 20, the Leupp Youth Home, and Childcare (WHP 2008g, pg. 2-20).

The Leupp Youth Home serves male adolescents, ages 13-17 years, who need home supervision and home living skills in a strict home life environment. The Leupp Youth Home has a capacity of six attendees and serves the entire Navajo Nation (WHP 2008g, pg. 2-20).

Other programs within the Chapter provide the following community services: Food Distribution, Department of Workforce Development, the Elderly Center, Leupp Fire Department, Capital Improvement Projects (CIP), and childcare, Head Start, Public Employment Program (PEP), housing construction, Community Health Representative Program, and renovation assistance (WHP 2008 g, pg. 2-20).

The Flagstaff Unified School District (FUSD) administers the public school system. FUSD buses Chapter students to Coconino High School, Flagstaff High School, and Sinaugua High School, which are all located in Flagstaff, Arizona (WHP 2008g, pg. 2-14).

The Leupp Elementary School provides a general education curriculum from preschool through eighth grade (WHP 2008g, pg. 2-14).

The BIA Office of Indian Education offers Native American Tribes the option of running their own school. The former Leupp Boarding School chose this option and incorporated under Leupp School, Inc. Leupp School, Inc. provides a general education curriculum from kindergarten through 12th grade. A dormitory is also available (WHP 2008g, pg. 2-14).

The Navajo Nation operates the Chapter‘s Head Start programs. Head Start is a preschool program for students between three and five years old (WHP 2008g, pg. 2-14).

NTUA provides electric service to approximately 323 customers in Leupp. Power lines extend along Navajo Roads 15 and 2, and Highway 99. Outlying areas do not have electricity. NTUA also provides streetlights to approximately 119 customers within the town of Leupp (WHP 2008g, pg. 2-53).

Navajo Tribal Utility Authority provides water to approximately 171 customers residing in the Chapter. The water is from a system in the town of Leupp that extends north along the road to the Hopi Reservation. Two booster stations and three wells supply water to the system. The NTUA manages the chlorine and adjusts the fluoride level. The existing water storage tanks are inadequate for the growing number of users. A 40,000-gallon tank is needed to properly serve all water users (WHP 2008g, pg. 2-53).

The Water Development Program is located inside the Chapter‘s 100-acre industrial park. Services include maintenance of windmills and water wells throughout the Western Navajo Agency (WHP 2008g, pg. 2-53).

NTUA maintains a two-cell sewer lagoon located north of the town of Leupp. NTUA wastewater service extends only to 132 customers in the town of Leupp. The lagoons produce unpleasant smells, and high winds pick up sediments and scatter them throughout the town of Leupp; a wastewater plant would solve this spread of sediments. Septic systems are used where wastewater service is not available (WHP 2008g, pg. 2-58).

According to field data conducted by WHPacific in 2008, thirteen percent of homes surveyed where connected to septic systems. Septic systems for residences are typically installed by IHS and turned over to the homeowner for maintenance and service (WHP 2008g, pg. 2-58).

Sanitary services are provided by public and private entities from surrounding towns. Coconino County provides solid waste collection through a transfer station, which is located in the Chapter‘s industrial park (WHP 2008g, pg. 2-58).

According to field data conducted by WHPacific in 2008, fifty-nine percent of homes surveyed in the Chapter are connected to public wastewater system, and twenty-eight percent are dependent on an outhouse (WHP 2008g, pg. 2-58).

NTUA provides natural gas service to approximately 193 customers (24% of Chapter residents) in the town of Leupp. Natural gas service is provided from an El Paso Natural Gas Company (EPNG) transmission system. EPNG, an interstate natural gas transmission pipeline company, has two underground pipelines located in a 100-foot right-of-way running parallel to Navajo Road 15 in an east-west direction. It also has a compression station located approximately three miles west of the Chapter House (WHP 2008g, pg. 2-60).

Transwestern Pipeline Company is also an interstate natural gas transmission pipeline company. They have two underground pipelines located in a 100-foot right-of-way running parallel to Navajo Road 15 in an east-west direction. Any crossings of EPNG or Transwestern Pipeline rights-of-way require prior notification and adherence to their company design standards. They will not allow any type of joint use of their right-of-ways such as roads or bike trails (WHP 2008g, pg. 2-60).

Propane is also widely used throughout the Chapter. Propane distributors are available in nearby towns (WHP 2008g, pg. 2-60). Fifty-seven percent of Chapter residents heat with wood (WHP 2008g, pg. 2-9).

The majority of Chapter members (64 percent) do not have telephone service available (WHP 2008g, pg. 2-10). Frontier Communications, based out of St. Michaels, Arizona, provides telephone service to customers in Leupp. Service is limited to areas within the town of Leupp and areas paralleling Navajo Road 15. The service area needs to be expanded to include more customers and households (WHP 2008g, pg. 2-62).

A Cellular One cellular tower is located on Navajo Road 15, approximately four miles west of the town of Leupp. This cellular tower is not enough to provide reliable and adequate phone service to all residents in the Chapter (WHP 2008g, pg. 2-62).

Leupp Chapter Environmental Safety Status

A groundwater test of the Dry Spring Well located in Box Canyon in the northern part of the Chapter indicated the presence of uranium in the water source. The uranium concentration level in the Dry Spring Well categorized this well as posing some cancer risk. More recent test results conducted by El Paso Natural Gas Company of seven wells located near the compressor station indicated the presence of chromium in the groundwater (WHP 2008g, pg. 2-55).

Leupp Chapter Water

Surface Water

Leupp lies within several watersheds within the Little Colorado River Basin, which is part of the larger Colorado River watershed basin. The area is drained to the northwest by the Little Colorado River, which is a tributary of the Colorado River (it is approximately 315 miles long). It rises in eastern Arizona and flows northwest, through a series of deep gorges, past the town of Leupp. It joins the Colorado River in the Grand Canyon, approximately 70 miles north of Flagstaff (WHP 2008g, pg. 2-39).

Dennebito Wash and Oraibi Wash drain the southwestern escarpment of Black Mesa. Flows from these washes drain to the Little Colorado River. Both washes flow only during periods of heavy rainfall or snow-melt, and runoff is very sporadic (WHP 2008g, pg. 2-39).

Canyon Diablo flows into the Little Colorado River from the southwest. Flows from San Francisco Wash, Young‘s Canyon, Padre Canyon, Babbitt Wash, and Yellow Jacket Canyon drain to Canyon Diablo and eventually join the Little Colorado River. Other smaller tributaries flow to the Little Colorado River; however, the water is lost by evaporation or reinfiltrates before the flow reaches the Little Colorado River. Many of these tributaries are unnamed (WHP 2008g, pg. 2-39).

Ground Water

Leupp is in the Little Colorado River Basin where water-bearing rocks consist primarily of sandstone, limestone, and other conglomerate. Though several aquifer systems underlie the Little Colorado River Basin, the Coconino aquifer is underneath the Leupp area. The Coconino aquifer is a multiple-aquifer system that encompasses several lithologic formations. The Coconino Sandstone is the principal lithologic unit of the Coconino aquifer. Other important water-bearing rock units include the Kaibab Formation and the Upper Supai Formation. The aquifer underlies the entire surface-water drainage of the Little Colorado River and is the most extensive and productive aquifer in the basin (WHP 2008g, pg. 2-41).

The areal extent of this aquifer is more than 27,000 square miles. The U.S. Geological Survey identified more than 1,000 wells and springs in Arizona and New Mexico. Groundwater development has increased steadily since the 1940s due to population growth and its demand for agricultural, industrial, and public water supplies. Groundwater pumping during the year of 1995 was about 140,000 acre-feet (WHP 2008g, pg. 2-41).

Groundwater movement in the aquifer is generally to the northwest. The aquifer is recharged from precipitation that infiltrates through fractured exposures of Permian and Pennsylvania rocks that occur primarily along the western and southern edges of the Little Colorado River Basin. Recharge also occurs in the northeastern part of the Little Colorado River Basin on the Defiance Uplift. Less significant recharge occurs through unconsolidated alluvium along the Little Colorado River and some of its tributaries. In addition to the aquifer, shallow groundwater occurs in alluvial sediments along streams and in volcanic rocks (WHP 2008g, pg. 2-41).

Wetlands and Floodplains

There are recorded wetlands within the Chapter, primarily associated with The Little Colorado River. Wetland area types located within the Chapter include riverine, freshwater forested/shrub, freshwater emergent, and freshwater ponds (USFWS 2016).

Historical surface water flow data is not available for most of the FBFA, nor are flood plain maps. Flood plain boundaries have not been determined by federal, state, or tribal entities. An inquiry with the Federal Emergency Management Agency in 2016 revealed that the Flood Insurance Rate Map (FIRM) for the unincorporated areas surrounding Leupp, Arizona, dated September 3, 2010, showed no flood prone areas (FEMA 2016).

Water Rights

Water rights are only mentioned in the CLUP at a regional level, not as a Chapter level project (WHP 2008g, pg. 4-21).

Chapter Water Needs

According to field data conducted by WHPacific in 2008, fifty-nine percent of homes surveyed in the Chapter are connected to public wastewater system, and twenty-eight percent are dependent on an outhouse (WHP 2008g, pg. 2-58).

Leupp Agricultural Resources

Community Farmers

Below are descriptions of two farms that exist in the Chapter. Though the farms have done well in the past, due to drought conditions and lack of resources farming has ceased or slowed. If resources were provided, farming could continue to be developed and fields would be farmed and cultivated. In addition, if Dinnebeto Wash were connected to irrigation, then this area could be farmed (WHP 2008g, pg. 2-36).

Leupp Farm

The Leupp Farm was established in 1985, approximately two miles north of the town of Leupp. It utilizes a total of 96.5 acres to grow alfalfa (WHP 2008g, pg. 2-35). The farm's minimum rate production for bales was 85 bales per acre, and the maximum was 650 bales per acre (this rate has been achieved sporadically and with two cuts). In 2002, the generator broke and farm production ceased. It is estimated to cost $27,000 to replace the generator (WHP 2008g, pg. 2-37).

The farm has a well, which is approximately 175 feet deep and produces 600 gallons per minute of quality water. The fence surrounding the farm is in good condition. Access to the farm is via Navajo Road 6732, which is unpaved (WHP 2008g, pg. 2-37).

Beaver Farm

Beaver Farm is located northwest on the south side of the Little Colorado River. Beaver Farm was established on an 80-acre tract. Roads leading to Beaver Farm are unidentified and unpaved (WHP 2008g, pg. 2-37).

Leupp Soils

Two primary soil categories occur within the Leupp Chapter boundaries. These include mesic arid soils and mesic semiarid soils. The area immediately surrounding the town site of Leupp are mesic arid soils held within the Moenkopie-Shalet-Tours Association to the west and the Tours-Navajo Association to the east (WHP 2008g, pg. 2-42).

The Moenkopie-Shalet Tours Association runs in a northwest-southeast band through the Chapter and consists of well-drained soils on plateaus and flood plains. The soils formed in residuum and alluvium weathered from sandstone, shale, and conglomerate rocks. Moenkopie soils make up about 60 percent of the association, Shalet soils 15 percent, Tours soils 15 percent, and minor areas of associated soils, 10 percent. The minor soils are mostly small areas of Ives, Jocity, Trail, Clovis, Palma, Claysprings, and Purgatory series. Also included are small areas of sandstone rock outcrop. Moenkopie and Shalet soils have low potential for forage production. Tours soils that receive extra water from runoff have fair-to-good potential under good management to produce forage. Factors limiting the potential of these soils for homesite development are the shallow depths to rock in the Moenkopie and Shalet soils. Also, the Tours

soils may be subject to flooding and have moderately slow permeability, which is poor for use as septic tank absorption fields (WHP 2008g, pg. 2-42).

The Tours-Navajo Association enters the Chapter from the southeast and fits snugly against the Moenkopie-Shalet-Tours Association to its west and to the southern extents of the Badland-Torriorhents-Torrifluvents (MA1) and the Sheppard-Fruitland-Rock Outcrop Associations. This association consists of well-drained soils on the flood plains and adjacent low alluvial fans of the Little Colorado River and its major tributaries. The soils formed in recent alluvium derived from sedimentary and volcanic rocks. Tours soils make up about 35 percent of the association, Navajo soils 35 percent, and minor areas of associated soils and riverwash about 30 percent. The minor soils are mostly Ives, Trail, and Jocity. The soils have fair potential under good management for producing livestock forage. Limited precipitation is the major factor, but these soils receive runoff from adjacent areas during wet periods. Riparian vegetation and adjacent irrigated cropland provide elements for good wildlife habitat in this association. The short growing season limits crops grown in irrigated areas to alfalfa, corn, small grain, and pasture grasses. Saline areas require careful management and reclamation practices. Factors limiting the potential of these areas for homesites and community uses are flooding hazard, moderately slow to very slow permeability, low bearing strength, salinity, erosion hazard, and potential frost action (WHP 2008g, pg. 2-42).

Additional soils to the north of Leupp's townsite include Badland-Torriorhents-Torrifluvents, the Sheppard-Fruitland-Rock Outcrop Associations, the Fruitland-Camborthids-Torrifluvents Association, and a small pocket of Tours-Navajo Association. West of the town site in the southwest corner region of the Chapter, the soils are mesic semiarid. The corresponding associations are the Winona-Boysag-Rock Outcrop Association and the Rudd-Bandera-Cabezon Association (WHP 2008g, pg. 2-42).

Leupp Biological Resources

Threatened and Endangered Species and Resource Protection Zones

Portions of the Chapter contain some sections classified by NNDFW as Resource Protection Zone 1, a highly-sensitive wildlife resource area. Within the Chapter, the following areas classified as RPZ 1: the Little Colorado River, Grand Falls, Canyon Diablo, and Tloi Lechii Cliffs (WHP 2008g, pg. 2-45).

The Little Colorado River is protected with a buffer zone from thick riparian vegetation to protect the yellow-billed cuckoo and southwestern willow flycatcher. Grand Falls is within the Little Colorado River protected area. Canyon Diablo is also protected with a buffer to protect golden eagles, peregrine falcon, mule deer, antelope, and elk (WHP 2008g, pg. 2-45).

The following areas of the Chapter are classified as RPZ 2; Sunrise to Old Leupp and Newberry Mesa (WHP 2008g, pg. 2-45).

The remainder of the Chapter is classified as RPZ 3, low sensitivity (WHP 2008g, pg. 2-46).

Leupp Mineral Resources

Minerals

There are at least four inactive gravel borrow pits within the Leupp area. These borrow pits were developed by the BIA for local road construction projects. The most active site is located approximately one mile north near the Chee family residence (WHP 2008g, pg. 2-37).

Leupp Cultural and Traditional Resources

Cultural Resources

The NNHHPD has inventoried and mapped the locations of several archeological sites and previous project locations, but the entire chapter has not been inventoried. NNHHPD does not reveal the locations of sensitive cultural sites due to the potential for vandalism, robbery, and the need to protect privacy. Hence the specific locations of cultural sites are not identified on maps.

The Chapter has also identified AOA, as previously discussed in the Leupp Land Use section. The Navajo's traditional subsistence lifestyle includes using the land to gather a variety of plants/herbs for medicinal and ceremonial purposes and materials for arts and crafts. The areas that provide these resources are considered "areas of avoidance" – traditionally and culturally sensitive areas to be protected from development in perpetuity to preserve their historic significance or ongoing ceremonial use.

While these areas are well-known by many elders and traditional Navajo residents, the younger generation does not necessarily share this knowledge and understanding. There is currently a lively debate about whether these special areas should be mapped or not. Proponents say that mapping helps preserve and pass on this important cultural and spiritual knowledge across generations and into the future; opponents say this information should be passed orally and personally from generation to generation. In either case, it is important for the Chapter to establish a policy and procedure for how to assure that lands planned for development are not areas to avoid. The Navajo Historic Preservation office does have maps of some of these areas, which it can check site by site as project proposals move forward for development (WHP 2008g, pg. 2-39).

Recently, the Chapter has noticed activities that threaten culturally sensitive areas and fragile environments. Four-wheelers have been driving uninhibited through Chapter lands, and tourists have been removing artifacts from Chapter land. These types of activities can do irreversible damage to culturally significant areas and environmentally sensitive areas and must be addressed in order to prevent them in the future (WHP 2008g, pg. 2-40).

Leupp Chapter Community Needs Assessment

The community needs assessment is based on information provided from the community workshops in 2008 that were hosted by WHPacific, Inc., comments provided by the community, and professional field assessments completed by WHPacific, Inc. in the summer of 2008 (WHP 2008g).

The community needs assessment includes Chapter Vision and Goals for the FBFA, resource needs, identification of specific actions and projects that need to be implemented in the FBFA, project phases by timeline, and preferred development sites within the Chapter.

Leupp Development Vision

The Chapter vision captures how Chapter members would like to see their community grow over the next 15 years. In the long-term, Chapter members want to maximize the benefits of modern opportunities, but at the same time maintain the integrity of traditional Navajo culture. Chapter residents want to preserve their rural atmosphere, but bring in modern amenities such as telephones, electricity, and plumbing to all residents who desire them (WHP 2008g, pg. 3-1).

Leupp Development Goals

During the community workshops held during Summer 2008, community members outlined goals for the Chapter that would aid in reaching this vision. These goals include community policies, capital projects, and community service (WHP 2008g, pg. 3-1).

Community facilities and service are an important part of the community vision. The Chapter wishes to improve education, including expanding educational facilities for the Chapter's youth. A multi-purpose community center will provide a place for community members to congregate for recreational activities or community meetings. A community store will provide jobs and basic necessities for Chapter members and tourists (WHP 2008g, pg. 3-1). The Chapter wishes to hire staff to provide additional chapter services and provide ongoing planning efforts in an expanded office space with updated office equipment (WHP 2008g, pg. 3-1).

Infrastructure within the community will be improved, particularly within the FBFA, to provide water and electricity to all residents. Solid waste will be collected safely and reliably at a Chapter transfer station. Improved cellular communications infrastructure will improve quality of life and safety for all residents (WHP 2008g, pg. 3-1).

Because of the high cost of providing municipal infrastructure to remote houses in the chapter, solar power with wind-powered back-up generators will be used to provide electricity to scattered rural homes. Rural homes will also have improved access to safe drinking water sources if the cost of connecting them to municipal services is too high. The Chapter will provide educational and training opportunities for residents and entrepreneurs to learn how to maintain these off-the-grid utilities (WHP 2008g, pg. 3-2).

Community facilities like a multipurpose center, schools, and an adult education center will provide computers and Internet access to support the curiosity, learning, and communication needs of all residents (WHP 2008g, pg. 3-2).

Economic development will improve quality of life for the Chapter and retail and recreational opportunities for tourists. Ranchers will have nearby water resources for livestock. Chapter vendors will be able to sell Navajo arts and jewelry to tourists. Affordable groceries will be available at a store within the Chapter (WHP 2008g, pg. 3-2).

Chapter residents will have a full range of education opportunities from school age through adulthood, including childcare, job training, leadership cultivation, culture and language sharing, and personal and business finance management (WHP 2008g, pg. 3-2).

The road system will be improved and maintained to be safe and efficient in all weather conditions and seasons (WHP 2008g, pg. 3-2).

Community facilities and parks will provide places for Chapter members to congregate. The existing rodeo facility is in poor condition and is not located on a main road. An improved and accessible rodeo ground will attract tourists and bring together residents of all ages (WHP 2008g, pg. 3-2).

Nearby emergency health, fire, and police facilities and substations will provide a quick response to medical and safety emergencies. Helicopter service to Tuba City can respond to major emergencies. All homes will be addressed for emergency response and within range of reliable cell phone service (WHP 2008g, pg. 3-2).

Ranching and raising grazing animals continues to be a rich and viable way of life in this part of the Navajo Nation (WHP 2008g, pg. 3-2). A nearby ranger station will help to manage rangelands prevent criminal activities such as theft of livestock. Range management education programs will help preserve the quality of the land and maintain this means of subsistence (WHP 2008g, pg. 3-2).

All residents who wish to live in Leupp will have safe, durable, energy-efficient homes with access to electricity and safe drinking water, whether they are located near the center of the community or in remote areas. Residents will have a full range of housing options to support each stage of life and all financial circumstances. Chapter members will be able to live in scattered home sites if they are grazers who prefer to live a subsistence lifestyle or clustered housing developments if they prefer the amenities and infrastructure of a modern community. Mobile home parks and rental houses will be available for people who may need to move from the Chapter in the future or for people who are in immediate need of a home. Elderly living facilities will allow independence while also providing assistance with preparing food, social opportunities, and medical care (WHP 2008g, pg. 3-2).

Guiding Development Principles

Chapter members outlined principles that should be used to guide development and protect culturally and environmentally sensitive land over the next 15 years (WHP 2008g, pg. 3-5).

It is important for the Chapter to provide for people's basic needs such as power and water. The Chapter needs to plan for improving the overall health of its members. Public safety and emergency medical service need to be improved to better respond to emergency situations (WHP 2008g, pg. 3-5).

Sustainable construction should be required for all new buildings. These buildings should be energy-efficient and designed to last many generations. Structures should be designed to work with the land in order to provide passive solar energy to further reduce energy costs. These structures should provide optimal protection from the elements with high-quality insulation to better regulate indoor temperatures and raised floors to protect against flooding (WHP 2008g, pg. 3-5).

New developments should not harm the natural environment or negatively impact traditional ways of life. It is important to protect water quality and groundwater for future generations. Other natural resources such as mineral deposits should also be used wisely to ensure sustainability. Any cultural sites within the Chapter should also be preserved. New developments in the Chapter should incorporate community-supported agriculture to provide healthy local food to the community (WHP 2008g, pg. 3-5).

The Chapter needs to protect and provide scattered housing as an option for remote areas and ranchers. Fencing around homes and cornfields will help keep cattle away from property that is easily damaged. Grazing areas should be located where cattle can be easily watched. Grazing should be protected as an ongoing way of life for people in the Chapter. The Chapter must educate grazing-permit holders on better range management practices and work to enforce these practices to ensure that this way of life can remain sustainable (WHP 2008g, pg. 3-6).

The Chapter needs to plan for jobs for the large and growing young population. According to Chapter members during the workshops, many members have moved to other communities in order to find employment. Creating jobs within the Chapter is essential to keeping younger population within the Chapter, or at least providing that opportunity (WHP 2008g, pg. 3-6).

New housing subdivisions should be built near necessary resources. Housing clusters should be constructed in areas where water and electricity are already available. These housing development sites should also be located within easy reach of community amenities such as emergency access (WHP 2008g, pg. 3-6).

It is important for the community to plan ahead before proceeding with growth. The Chapter needs to protect natural resources such as water, wildlife, and cultural areas. Plans need to be

created to handle the hazards of new industrial opportunities before committing to new operations (WHP 2008g, pg. 3-6).

Leupp Chapter Development Obstacles

The Leupp Chapter has identified development obstacles and formulated possible solutions to surpass or avoid them. Some of the obstacle the Chapter sees are no financial management plan, absence of active involvement, no community infrastructure, lack of a complete development plan, lawful restrictions, and outdated community assessment (WHP 2008g, pg. 3-3, 3-4).

Leupp Chapter Strategic Directions

In order to surpass these development obstacles, the Chapter has identified strategic directions for each obstacle. To promote community involvement, the Chapter needs to improve involvement with all Chapter members. Improved visual presentations, such as PowerPoint presentations, can engage an audience much better with strong graphic aids. Mailings to individual Chapter members and radio announcements will inform Chapter members of upcoming meetings. Meals provided during public meetings can draw members to a meeting during lunch or dinner hours. Bilingual presentations are more inclusive for all members. By scheduling public meetings on weekends, more Chapter members will be able to attend community meetings because fewer members will be at work (WHP 2008g, pg. 3-4).

Newsletters sent to Chapter members will inform them of current events and upcoming meetings. Expanded use of the Internet can help the Chapter reach members who are not able to attend community meetings and will allow for feedback beyond the timeframe provided by a meeting. Email and regular mailings should be used to remind members of upcoming elections. It is important to encourage and reward Chapter members to participate in the public process (WHP 2008g, pg. 3-4).

A financial plan is needed to determine the amount of resources needed to address these needs and how resources will be allocated. It will also determine the amount of resources allowed to employ a grant writer and planner to help facilitate this process (WHP 2008g, pg. 3-4).

To help stop the loss of language, cross-cultural and cross-generational mentoring will help tribal members share their cultural experience and knowledge. The Chapter needs to promote the preservation of the Navajo language by encouraging bilingual education and conversation. The Chapter also needs to encourage Ké, Navajo common law, which is a gesture of Navajos respecting one another and placing Navajo customs and beliefs above government rules (WHP 2008g, pg. 3-4).

The Chapter needs to develop and adopt a Comprehensive Land Use Plan (CLUP) that defines the problems, has long- and short-range goals, and prioritizes projects. Projects should be prioritized with a detailed cost analysis (WHP 2008g, pg. 3-5).

Enhancing the qualifications of people in the workforce is an important part of economic development in the chapter. During the workshops, members identified a need for workforce training. The Chapter could provide cardiopulmonary resuscitation (CPR) and food handler training, which are essential to the hospitality industry. Scenic views and proximity to the Grand Canyon provide the Leupp Chapter with potential for growth in the hospitality service industry (WHP 2008g, pg. 3-5).

Satellite continuing education courses from nearby vocational schools could further provide training for the local workforce. In addition, this vocational training could be incorporated into the local high school curriculum to provide the Chapter's youth with the skills necessary for holding quality jobs on the reservation (WHP 2008g, pg. 3-5).

Possibly the most important part of enhancing the workforce and maintaining qualified employees in the Chapter is to provide competitive salaries. It is not uncommon for Navajo Nation residents to seek higher-paying employment in nearby off-reservation communities. Seeking private grants or establishing relationships with private funders may provide the resources for recruitment efforts that include a guaranteed salary or scholarships in exchange for a commitment of particular years of service within the community (WHP 2008g, pg. 3-5).

Leupp Chapter Community Needs

Community Resource Needs were identified and divided into the following areas:

- Infrastructure/Utility
- Transportation
- Housing
- Health and Public Safety
- Community Facilities
- Economic Development
- Education
- Open Space, AOA, and Grazing

Infrastructure

All Chapter members need to be connected to water, wastewater, power, and to a telephone. Before this can take place a wastewater treatment plant needs to be constructed. Many homes do not dispose of their trash properly because there is no solid waste transfer station (WHP 2008g, pg. 3-6).

The Chapter has identified Dinnebeto Wash and Grand Falls as areas that it wants to develop. Dinnebeto Wash needs to be connected to irrigation water. Grand Falls needs to be connected to water and electricity (WHP 2008g, pg. 3-6).

Improved cellular communications infrastructure will improve quality of life. Some rural Chapter members do not have cell phone service or other telecommunications service at their homes. These people have to drive to locations where cell phone service is available in order to make a phone call, a major inconvenience that could add time to emergency response. In addition to spotty cellular communications, Internet access is also sparse (WHP 2008g, pg. 3-6).

Transportation

The current road system needs major improvements. During the wet season or heavy snow-melt transportation between communities becomes unreliable because roads are washed away or destroyed. This type of destruction is inconvenient and dangerous not only to Chapter members, but emergency response is halted or drastically delayed. A transportation plan needs to be developed to identify and prioritize what improvements need to take place. A road to Grand Falls paralleling the Little Colorado River with a bridge is needed (WHP 2008g, pg. 3-6).

Housing

At the planning workshops, participants identified the top need as housing, particularly in the FBFA. Chapter members desire new homes constructed of long-lasting materials. A diversity of housing types is needed within the Leupp Chapter. Group homes for the elderly are needed to house the aging population. In the past, many newly constructed homes were provided to elders, leaving young families still in need of housing. Clustered housing is needed in the central community area near municipal utilities, and other community amenities. There is also a need for mobile home sites, which are ideal for residents who do not have time to acquire a homesite lease or might want to move elsewhere in the future (WHP 2008g, pg. 3-7).

Health and Public Safety

Although there are healthcare facilities in the Chapter, there is a need for more advanced and specialized medical services that only a hospital, elder care center, or nursing home can provide. The Chapter has access to a police service and a fire station; however, the facilities are inadequate. A new police station and fire station are needed it the community. Also, there is a need for an improved communications system, because the current one is unreliable and increases response time (WHP 2008g, pg. 3-7).

Community Facilities, Parks, and Recreation Needs

The Chapter House is used by community members for meetings and is considered a center of the community; however, there is a need for more room. A multi-purpose facility needs to be constructed that will provide this additional space. The multi-purpose facility can house the daycare facility, youth recreation center, church, and computers (WHP 2008g, pg. 3-8).

Chapter members also identified the desire to develop Grand Falls and designate land for a veteran‘s memorial park and amusement park (WHP 2008g, pg. 3-8).

Economic Development

There is a need for more employment opportunities for all Chapter members (WHP 2008g, pg. 3-8). Although there already exist ranching and farming industries in the Chapter, these industries need to be managed better. A range, livestock, and farming management plan needs to be developed to improve and expand services (WHP 2008g, pg. 3-9).

The construction of bullpens, earthen dams, irrigation to Dinnebeto Wash, and a windmill are facilities that would improve ranching and farming capabilities within the Chapter.

Chapter members identified a need for a gas station, grocery store, and laundromat. Chapter members felt that a Casino would be profitable in the area, as well as a radio station. The Chapter is located in an environment that has great sun and exposure. Chapter members also identified the need for solar panels and wind power (WHP 2008g, pg. 3-9).

Education

There are educational facilities available for young children, but there are no facilities or programs for lifelong learning. The Chapter needs to secure funding for continuing education programs and pre-school programs. An educational needs assessment needs to be conducted in order to justify new schools within the Chapter. Suitable sites need to be identified and withdrawn for any new facility. The Chapter will have to coordinate with other government agencies to secure funding for new educational facilities and programs (WHP 2008g, pg. 3-9).

Open Space, "Areas of Avoidance," and Grazing Needs

The Chapter landscape is fragile. The Chapter needs to create programs to protect water quality, wildlife, and minerals in the area. During the Chapter workshops, participants identified several AOA such as Grand Falls (WHP 2008g, pg. 3-9).

Leupp Chapter Priority Capital Improvement Projects

These needs are fully outlined in the 2008 Leupp CLUP (WHP 2008g). Once these resource needs were identified, the Chapter voted on which actions/projects should be addressed first through a vote. The top projects the residents would like to see occur first include scattered housing, power line in Grand Falls and other areas, paved road to Cameron along Little Colorado River, Bridge, and Grand Falls, affordable grocery store, humane society (cats/ dogs), trash collection, hospital, elder care/ nursing home, water development in Grand Falls and other areas, waterline extensions for all areas, increased computer use and facilities, salvage and recycling, Veterans Memorial Park, cellular tower/ reception, laundromat, and life skills/communication (WHP 2008g, pg. 3-1).

Leupp Chapter Priority Project Phasing

This section outlines the phasing of the projects that received the most individual votes from Chapter residents at the community workshops. Phase 1 would be constructed in 5 years or less,

Phase 2 would be constructed in 5-10 years, and Phase 3 projects would not be complete for another 10-15 years (WHP 2008g, pg. 3-11).

Phase 1 Projects: 1-5 Years

The following represent the projects identified as part of Phase 1 Developments by the voting groups. These are considered the items most urgently needed by Chapter residents (WHP 2008g, pg. 3-11):

Community Facilities

- Youth Recreation
- Multi-purpose center with library
- Daycare
- Church
- Chapter House Renovation & Addition (Design Complete)
- Senior Citizen Center
- Post Office

Healthcare

- Feasibility Study for Nursing Home
- Improved Healthcare
- Elder Care/Nursing Home
- Dental

Education

- Maintain Existing Public School
- Opportunities for Lifelong Learning
- Life skills/Communication
- Skill Center/VoTech

Infrastructure and Utilities

- Power line Development Plan
- Power line Extension – North Grandfalls (4 phases, 23 families)
- Power line Extension – South Grandfalls (2 phases, 15 families)
- Power line Extension – North Leupp (2 phases, 10 families)
- Power line Extension – South Leupp (18 families)
- Power line Extension – East Canyon Diablo (23 families)
- Power line Extension – West Canyon Diablo (5 phases, 33 families)
- Earthen Dam – Identify all sites/clean out
- Windmill Livestock
- Water Development in Leupp Chapter/Plan Area
- Solid Waste Management/Recycle
- Transfer Station

Open Space, Cultural Sites, and Grazing

- Preservation of Wildlife (identify areas to preserve)
- Range Management
- Livestock Management
- Preservation of Grand Falls
- Farm Development North of Beaver Farm
- Bull Pens
- Alfalfa Farm/Field (explore feasibility)
- Improvement of Individual Farm Fields

Economic Development (WHP 2008g, pg. 3-12)

- Casino Development
- Gas Station
- Affordable Grocery Store
- Rental Units/Apartments for Non-residents

Public Safety

- Fire Department
- Police Department
- Improved Communication System (Safety) – 911
- Humane Society (cats/dogs); Availability of Services
- Trash Collection/Recycling Bins
- Ambulance Service (Helipad)
- Rural Addressing

Transportation

- Thoroughfare (Roads) Plan

Housing

- Scattered Housing
- Clustered Housing in Main Development Area

Media

- Increased Computer Use and Facilities

Phase 2 Projects: 5-10 Years

These are projects that realistically will take 5-10 years to get on the ground (WHP 2008g, pg. 3-12):

Healthcare

- Hospital/Clinic
- Eye care

Infrastructure and Utilities

- Telephone Landline
- Dinebito Wash (irrigation water)
- Cellular Tower/Reception for All Areas
- Wastewater Treatment
- Lagoon in All Areas
- Waterline Extensions for All Areas
- Septic Tanks for All Areas

Economic Development
- Wind power along Colorado River (feasibility study)
- Eating Establishment
- Solar Panels
- Laundromat
- Vet Clinic

Public Safety
- Paved Road to Cameron
- Grand Falls Crossing Development
- Bridge at Grand Falls – Upgrade Bridges

Parks and Recreation
- Grand Falls Development

Phase Projects: 10-15 Years

The following represents the project identified by one small group as part of Phase 3 Developments. This project should be considered part of future efforts to expand economic development opportunities for local residents, including providing additional jobs and adding on to existing livestock management knowledge and expertise (WHP 2008g, pg. 3-13):

Community Facilities
- Airstrip

Economic Development
- Bank

Parks and Recreation
- Amusement Park
- Veteran‘s Memorial Park

Media
- Radio Station

Preferred Development Sites

The Chapter identified several areas as ideal locations for future development. There are plans for a business park in the southern portion of the Chapter (WHP 2008g, pg. 4-31). One potential development site was identified away from the business center but also in the southern portion of the Chapter (WHP 2008g, pg. 4-31). This is a location suitable for wind power generation.

Agricultural projects are geared to on-site improvements, such as earthen dams to create livestock ponds, moveable and permanent fencing, windmills, and pasture improvements. These projects are dispersed throughout the Chapter and would benefit individual sites (WHP 2008g, pg. 4-31).

Housing projects are planned for the FBFA in the form of new scattered housing (WHP 2008g, pg. 4-31).

2.7.7 Tolani Lake Chapter

This Chapter includes the community of Tolani. It is bordered by Coalmine Canyon Mesa Chapter and the Hopi Reservation to the north, the Teestoh Chapter to the east and the Leupp Chapter to the west. Approximately eighteen percent of the Chapter (28,263 acres) is located within the FBFA (WHP 2008h, pg. I-1).

Tolani Lake Chapter Physical Setting

The topography includes sand dunes, red mesas with valleys, hills, and arroyos, as well as rich basins along the arroyos that are suitable for farming. One of the four Navajo sacred mountains, the Dook'o'oosliid, is located to the west of the Chapter (WHP 2008h pg. I-6). Chapter elevation varies between 1,400 meters above sea level to 1,630 meters above sea level.

The Chapter is less than 40 miles away from the Grand Canyon National Park, which received 4.4 million visitors in 2007 (WHP 2008j). Visitors have the option to take a 57-mile scenic drive from Cameron to the Grand Canyon Village along Highway 64, following the Little Colorado River Gorge, and passing through the Little Colorado River Tribal Park (WHP 2008j). Chapter vendors offer arts and crafts for sale at two scenic overlooks along this route. Highway 89 runs north from Flagstaff through the Cameron Chapter. This route is a heavily traveled route that brings significant tourist traffic through the Chapter (WHP 2008j).

Tolani Lake Chapter Land Status

The northwestern portion of the Chapter is located within the former Bennett Freeze Area. These lands were in dispute between the Navajo and Hopi Tribes, and so Interior Secretary Bennett placed a hold on construction, development, and the maintenance of structures in 1966. The Chapter is located within Navajo Nation Land Management District 5 (WHP 2008h, pg. II-28). The Chapter is comprised of trust land with no private holdings (WHP 2008h, pg. II-27).

Tolani Lake Chapter Land Use

The majority of the Chapter's land is used for grazing cattle and sheep. Tolani Lake is located within Grazing District 5 of the Navajo Nation. The majority of the 157,240.40 acres in Tolani

Lake is used for grazing purposes. There is no commercial farming in the area, except for one 170-acre community farm, Sand Springs Farm (WHP 2008h, pg. I-5).

Tolani Lake Chapter Population and Housing

Presently Tolani Lake has a population of approximately 400 people in the developed area of the Chapter (WHP 2008h, pg. I-5), but the 2000 U.S. Census states that the population for the Chapter was 755 individuals (WHP 2008h, pg. II-1). The community of Tolani Lake includes a Chapter House and Tolani Lake Elementary School Academy with approximately 50 students. Development efforts currently include the Chapter House, Head Start Building, Senior Citizens Center, Elementary School, and about 100 Navajo Housing Authority (NHA) housing units. The Chapter has widely scattered home sites where Navajo families continue traditional use of land for livestock grazing, and many remotely located Navajo families have built their own homes (WHP 2008h, pg. I-5).

Tolani Lake Chapter Government and Utility Infrastructure

Employment opportunities are very limited in the Tolani Lake Chapter, and most of the workforce is employed by private companies and government entities in Leupp, Tuba City and Flagstaff. Most work for private companies (49.7%) and 41.8 percent work for the government (WHP 2008h, pg. II-17).

Infrastructure for Tolani Lake includes water, wastewater, electric, telecommunications, and road systems in the main community area, which are available to developed areas of the Chapter and limited to areas in the outskirts of the community, particularly in the FBFA. Infrastructure and utilities are recommended for an upgrade before new development occurs (WHP 2008h, pg. II-34).

Currently the Chapter does have electrical power, but it is not sufficient for its use. Three-phase power is needed to support current and future development, but the current power available is single phase. Solar power is anticipated for development and should be provided to all families in remote areas (WHP 2008h, pg. II-35).

A wastewater system is needed in the Tolani Lake community, and there is a preference that a low-cost system be provided to residents located away from a major wastewater line, with assistance for periodic servicing if it is a septic system. In addition, a solid waste transfer station is needed so that people can dispose of waste in a proper and safe manner. Unfortunately, unsanctioned dumping sites are common in the chapter and create health hazards. Most people in the chapter use wood as their primary heating source since natural gas infrastructure is not present. In addition, propane is widely used throughout the Chapter and there are distributors available in nearby towns. According to the 2000 U.S. Census, only about 17 percent of Chapter residents have access to phone lines. Therefore, more Chapter residents have come to rely on

their cell phones for communication, but cell phone coverage and services are incomplete and insufficient in the area. Internet service is available in the Chapter, but it is unreliable and insufficient and needs to be improved (WHP 2008h, pg. II-39).

There are a number of roads in the Chapter that need to be relocated, renovated, or constructed, such as Navajo Road 6720 that connects the Chapter to Tuba City and needs to be relocated west of its current position, in order to avoid Hopi land. Owning a car is a necessity for people who live in remote portions of the Chapter since there is no regional public transportation in the Western Agency, and water has to be hauled in by the resident. In addition, shopping and services are located in neighboring chapters or nearby cities such as Winslow and Flagstaff (WHP 2008h, pg. II-43).

Tolani Lake Chapter Environmental Safety Status

There is no commercial or industrial activity in Tolani Lake, and when uranium mining operations located north of the community were abandoned, the trading post closed after the business lease expired (WHP 2008h, pg. II-18). The nearest abandoned uranium mine to the Tolani Lake Chapter and located within the FBFA is approximately 7 miles northwest of the Chapter.

Tolani Lake Chapter Water

Surface Water

Neither flood plain maps nor historical surface water flow data is available for most of these areas. The Dinnebeto Wash crosses the chapter, but there are no bridges over this wash and rural unpaved roads that cross it are impassable when water is present. Other major surface water features include the Polacca Wash and the Oraibi Wash (WHP 2008h, pg. II-30).

Chapter surface water is used for agriculture and livestock. When it rains, streams and washes are filled with water, which in turn fills watering holes. During times of drought, livestock has access to well water, either directly from the well or hauled to watering places.

The Chapter lies within the Little Colorado River Basin, which is part of the larger Colorado River water system. The Little Colorado River rises in eastern Arizona and in southeastern Apache County and flows northwest through a series of deep gorges directly underneath the Chapter's planning area. It joins the Colorado River in the Grand Canyon, approximately 70 miles north of Flagstaff (WHP 2008c, pg. 2-34).

There are at least 4 washes concentrated in the northern portion of the planning area.

Ground Water

Groundwater in portions of the Chapter can be found at 137 feet below the surface. The Chapter is located along the edges of the Little Colorado River Basin where water-bearing rocks consist

primarily of sandstone, limestone, and other conglomerates. Monoclines cross the area and provide structural control for the movement of groundwater along the regional gradient. The Chapter acquires its water from the C-aquifer, which can be provided in the form of underground waterlines or in safe, tested, and monitored nearby watering points, which are locations where individuals travel to in obtain their water (WHP 2008h, pg. II-36).

The Coconino Sandstone

The C-aquifer system yields water of good chemical quality except southwest of Leupp and in the northern part of the Black Mesa basin where excessive amounts of dissolved solids could render it unfit for use. The C-aquifer includes the Coconino Sandstone, the De Chelly Sandstone, the Moenkopi Formation, and the Shinarump Member of the Chinle Formation. The Coconino Sandstone is of very fine to medium-grained, well-sorted quartz grains. The grains are coarse near the southern extend of the unit along the Mogollon Rim and grade into a finer grain size to the north. The De Chelly Sandstone is a thick-bedded fine- to medium-grained sandstone and hydraulically connected with the Coconino and the Shinarump Member of the Chinle Formation. The Chinle and Moenkopi Formations consist primarily of mudstone and siltstone beds. The Chinle Formation and the De Chelly and Coconino Sandstones are the primary sources of groundwater. The other members of Chinle Formation and the Moenkopi Formations are too fine-grained and act as aquicludes. The C-aquifer system thins rapidly to the north and pinches out along the Utah-Arizona border (WHP 2008c, pg. 2-41).

Wetlands and Flooplains

Historical surface water flow data is not available for most of the FBFA, nor are flood plain maps. There are some recorded wetlands in the Chapter and fresh water ponds located northwest of the community of Tolani. Flood plain boundaries have not been determined by federal, state, or tribal entities. An inquiry with the Federal Emergency Management Agency in 2016 revealed that the Flood Insurance Rate Map (FIRM) for the unincorporated areas of Coconino County, Arizona, dated June 5, 1997, showed that all areas of the Navajo Indian Reservation have not been mapped for flood plain hazards (WHP 2008h, pg. II-30).

Water Rights

In portions of the Chapter, water systems have had to be abandoned because of contamination, and so new water rights are very difficult to obtain since they are, for the most part, fully appropriated. Those who currently have rights to clean water are reluctant to sell or part with them (WHP 2008h, pg. III-4).

Chapter Water Needs

Waterlines and other utilities are often not constructed until there are structures or development planned. In addition, development is only planned for areas that currently have infrastructure to support them. In Tolani Lake, existing structures in remote areas have not been connected to water or utilities since they are not available in those areas.

Tolani Lake Agricultural Resources

Community Farmers

Tolani residents consider traditional, community farming of crops such as corn, squash, and beans very important to their way of life. Workshop participants noted that irrigation infrastructure should be developed for larger community and commercial farming opportunities, and more dry farming could be added. The Chapter needs to create policies and programs to protect water quality, wildlife, and minerals in the area, and that some areas should be avoided such as shrines, eagle nests, burial sites, archeological sites, and Dinebito Wash (WHP 2008h, pg. III-13).

Much of the Chapter's land is leased to grazing-permit holders, and raising grazing animals is a way of life for many residents and should be protected and strengthened. A range management plan is needed for completion and enforcement in order to address overgrazing and to protect grazing areas (WHP 2008h, pg. III-13).

Tolani Lake Soils

The soil composition within the Chapter ranges from sand to loamy sand soils. The soil profile includes light reddish-brown sand: reddish-brown; single grain: loose, very friable, nonsticky: diffuse boundary; very fine roots; no observable pores between 0-18 inches. The deeper layer includes light reddish-brown sand: reddish-brown; single grain: loose, very friable, nonsticky: diffuse boundary; very fine roots; no observable pores between 18-36 inches. Increase of lime with progressive increase in depth (WHP 2008h, pg. II-32).

Tolani Lake Biological Resources

Threatened and Endangered Species and Resource Protection Zones

The northern portion of the Chapter contain some sections classified by the NNDFW as Resource Protection Zone 1, a highly sensitive wildlife resource area. The central portion west of Tolani is designated as Resource Protection Zone 2. The remaining area within the Chapter is designated as Resource Protection Zone 3, which is considered a low- sensitivity area (found at: http://www.nndfw.org/zones/chapter_home.htm).

Tolani Lake Mineral Resources

Minerals

The Chapter needs to create policies and programs to protect water quality, wildlife, and minerals in the area, and mineral deposits should also be used wisely to ensure sustainability (WHP 2008h, pg. III-6-13).

Uranium is known to exist within the Chapter as evidenced by a remediation plan for contamination caused by uranium mining, which would involve a study to conduct inventory on

uranium contamination sites throughout the region and develop a strategic plan to remedy environmental health hazards (WHP 2008h, pg. IV-11).

Tolani Lake Cultural and Traditional Resources

Cultural Resources

The NNHHPD has inventoried and mapped the locations of archeological several sites and previous project locations, but there is currently a lively debate about whether these special areas should be mapped or not. Some say that mapping helps preserve and pass on important cultural and spiritual knowledge across generations and into the future, while others say this information should be passed orally and personally from generation to generation. Either way, the chapter needs to establish policies and procedures for how to assure that lands planned for development are not areas to avoid. Recognized archeological sites, shrines, eagle nests, and burial sites need to be protected from development and preserved (WHP 2008h, pg. II-33-34).

The Navajo's traditional subsistence lifestyle includes using the land to gather a variety of plants/herbs for medicinal and ceremonial purposes and materials for arts and crafts. The areas that provide these resources are considered "areas of avoidance" – traditionally and culturally sensitive areas to be protected from development in perpetuity to preserve their historic significance or ongoing ceremonial use (WHP 2008h, II-33-34).

Tolani Lake Chapter Community Needs Assessment

The community needs assessment includes infrastructure and utility needs; transportation needs; housing needs; health and public safety needs; community facilities, parks and recreation needs; educational needs; economic development needs; and open space, "areas of avoidance," grazing and agricultural needs. In addition, there is need for the Chapter Vision and Goals for the FBFA, resource needs, identification of specific actions and projects that need to be implemented in the FBFA, project phases by timeline, and preferred development sites within the Chapter (WHP 2008h, pg. III-7-13).

Tolani Lake Vision

The Chapter's vision includes each home having adequate plumbing and access to safe water for drinking and domestic use. Homes that are too far from existing systems should be retrofitted for plumbing and provided nearby watering points, where safe water for drinking and domestic use can be collected and hauled; and homes located close to existing water systems should be hooked up (WHP 2008h, pg. III-7).

In the long-term, Chapter members want to maximize the benefits of modern opportunities, but at the same time maintain the integrity of traditional Navajo culture. Chapter residents want to preserve their rural atmosphere, but bring in modern amenities such as telephones, electricity, and plumbing to all residents who desire them.

The Tolani Lake Chapter would like to achieve this vision in the following way (WHP 2008h, pg. III-1);

Tolani Lake Chapter will ensure that all residents have homes in a safe, livable condition, including basic infrastructure such as electricity, telephone, and plumbing. Members of the Chapter will have access to shopping, health services, employment, education, and recreational opportunities to improve the quality of life for all residents.

Tolani Lake Chapter Goals

Guiding Principles

During the 2008 community workshop, members outlined goals for the Chapter that will aid in reaching the vision, which include community policies, capital projects, and community service (WHP 2008h).

The Chapter would like to provide for people's basic needs, such as power and water. The Chapter needs to plan for improving the overall health of its members. Public safety and emergency medical service needs improvement to better respond to emergency situations (WHP 2008h, pg. II-1-2).

Chapter members will have places to gather and meet, students of all ages will have educational opportunities, additional economic and industrial development will provide employment opportunities for all Chapter members, and all residents will have adequate public safety (WHP 2008h, pg. III-2).

New developments should not harm the natural environment or negatively impact traditional ways of life. It is important to protect water quality and groundwater for future generations. Other natural resources such as mineral deposits should also be used wisely to ensure sustainability. Any cultural sites within the Chapter should also be preserved. New developments in the Chapter should incorporate community-supported agriculture to provide healthy local food to the community (WHP 2008h, pg. III-1-2).

Tolani Lake Chapter Goals

During the community workshops held during summer 2008, community members outlined goals for the Chapter that will aid in reaching this vision. These goals include community policies, capital projects, and community service (WHP 2008h, pg. III-1).

All residents who wish to live in the Chapter will have safe, durable, energy-efficient homes with access to electricity and safe drinking water, whether they are located near the center of the community or in remote areas. Residents will have a full range of housing options to support each stage of life and all financial circumstances. Chapter members will be able to live in scattered homesites if they are grazers who prefer to live a subsistence lifestyle, or clustered

housing developments if they prefer the amenities and infrastructure of a modern community (WHP 2008h, pg. III-1-2).

The road system will be improved and maintained to be safe and efficient in all weather conditions and seasons. Infrastructure within the community will be improved, to provide water and electricity to all residents. Solid waste will be collected safely and reliably at a Chapter transfer station (WHP 2008h, pg. III-2).

Improved cellular communications infrastructure will improve quality of life and safety for all residents. Nearby emergency health, fire, and police facilities and substations will provide a quick response to medical and safety emergencies (WHP 2008h, pg. III-1-3).

Community facilities and services are an important part of the community vision. The Chapter wishes to improve education, including educational facilities for the Chapter's youth. A multi-purpose community center will provide a place for community members to congregate for recreational activities or community meetings (WHP 2008h, pg. III-1-2).

Economic development will improve quality of life for the Chapter and retail and recreational opportunities for tourists. Ranchers will have nearby water resources for livestock (WHP 2008h, pg. III-2).

Tolani Lake Chapter Obstacles

The Tolani Lake Chapter has identified development obstacles and formulated possible solutions to surpass or avoid them. Some of the obstacles include lack of available land for development. There is not much land available for community development facilities or new homes due to the large number of grazing permits in the Chapter. The land withdrawal process to remove some of the grazing land to be used for development is a lengthy process that many grazing permit holders may not support. This is due to lack of adequate compensation for the grazing land withdrawal and the absence of feasibility studies for economic development projects that could allow land to be withdrawn for projects that are not justifiable (WHP 2008h, pg. III-3).

There have been a number of studies conducted to determine the needs of the Chapter, which have proposed a number of alternatives to address the Chapter needs. However, many people feel they have not received the support of tribal leaders and the Navajo Nation's central government. When a study is conducted and there is support for a project, usually there are not enough resources to complete it. Very few individuals know how to successfully access federal funding, and funds allocated to the Chapter come with guidelines that are difficult or impossible to meet or achieve. Usually funds are not sufficient to cover the full cost of the project, so more funding sources are needed to complete it (WHP 2008h, pg. III-3-4).

The Chapter will need to balance the protection of grazing land with the development of facilities to improve the quality of life of all residents since ranching is part of the community's

vision for the future. This negotiation will require much public education and ongoing discussion to acquire (WHP 2008h, pg. III-3).

In order to determine where and how future growth will take place, a suitability or feasibility study needs to be conducted. Progress needs to be seen in order to believe in planning or to have reasons to get involved. There are political obstacles from Navajo Nation departments, other agencies, and politicians that prevent projects from being completed (WHP 2008h, pg. III-3-4).

Water systems have had to be abandoned due to contamination in some areas. New water rights are very difficult to obtain since they are typically already taken, and those who currently have rights to clean water are reluctant to sell or part with them. In addition, the Chapter is experiencing a greater need for housing than there is supply (WHP 2008h, pg. III-3-4).

Tolani Lake Chapter Resource Needs

Community Resource Needs were identified and divided into the following areas;

- Infrastructure/Utility
- Transportation
- Housing
- Health and Public Safety
- Community Facilities
- Economic Development
- Education
- Open Space, AOA, and Grazing

Proposed Capital Improvement Projects

Participants nominated and voted on the following items as the most important capital projects from the vision over the course of the two workshops. The highest priority improvement projects include scattered housing, power line in Grand Falls and other areas, paved road to Cameron along Little Colorado River, bridge and Grand Falls, affordable grocery store, humane society for cats and dogs, trash collection and casino (WHP 2008h, pg. III-14).

Tolani Lake Chapter Priority Capital Improvement Projects

These needs are fully outlined in the Tolani Lake CLUP 2008, pages III-14. Once these resource needs were identified, the Chapter voted on which actions/projects should be addressed first through a vote.

Tolani Lake Chapter Priority Project Phasing

This section outlines the phasing of the projects that received the most individual votes from Chapter residents at the second community workshop. Phase 1 would be constructed in 5 years or less, Phase 2 would be constructed in 5-10 years, and Phase 3 projects would not be complete for another 10-15 years (WHP 2008h, pg. III-15-19).

Phase 1 Projects: 1-5 Years

The following represent the projects identified as part of Phase 1 Developments by the voting groups. These are considered the items most urgently needed by Chapter residents (WHP 2008h, pg. III-15-17):

Public Safety

- Police Officers in Tolani Lake (increase #)
- Emergency Clinic/Trauma Center (make accessible)
- Community Nurse – reestablish through CHR
- Mobile Van for Healthcare, 1 time per month
- Mobile Van for Dental Care (continue present arrangement/available upon request)
- Security Lights – work on individual basis with NTUA; replace sensor lights on individual homes
- Direction Signs
- Cattle Guards at identified locations
- Emergency Preparedness Plan
- Rural Addressing System

Health

- Medicine Men (NAC, traditional, licensed)
- Health care Clinic; Dental; Disabled Clinic
- Mobile Van for Health Care/Mobile Van for Dental Care – Expand Mobile Services to FBFA
- Community Health Representative
- Disease Prevention
- Family Counseling
- Alcohol/Tobacco/and other Drug Programs
- Peace-making Center
- Educational Programs
- Veteran Center – reestablish at Tolani Lake

Community Facilities

- Group Home for Elderly
- Senior Center

- Recreation Center
- Church
- Multi-purpose Recreation Center with Computer Center, Meeting Rooms, Conference Room
- Sub-office for Bennett Freeze issues – regional office
- Social Services Office
- Post Office
- Chapter House Improvement
- Health Care Clinic
- Veterinarian
- Head Start
- Livestock Yard
- Peace-making Center/Conflict Resolution
- Veteran Center

Infrastructure Utilities

- Increased Carrying Capacity – 3 phase electric lines
- Waterline; Drinking Water and Emergency Use
- Power lines to Workers, Al McCabe, Cal Nez, Williams; tied with waterline
- Drinking Water for Workers, McCabe, Nez, Williams
- Watering Point
- Livestock Waterline – need feasibility study; possible source is Beaver Farm
- Water Storage Tanks; 2-3; tied with drinking water for Workers, watering point, and water for livestock
- Solid Waste Transfer Station
- Wastewater system; low cost to residents
- Internet
- Landline Phone Lines; Tied with Internet
- Cell Phone Tower/Service
- Solar System
- Earthen Dam
- Water User Association
- Livestock Association
- Water Hauling
- Firewood

Economic Development

- Feed Store; Horseback riding (trail rides)
- Flea Market; agriplex
- Activity Center
- Tolani Lake Enterprise
- Hay

Transportation

- Move Road to Tuba City west to avoid Hopi Lands through BF, #6720 to Coalmine
- Road to Tuba City
- Y-west (Hopi managed?) maintain 6730
- New Paved Crossing for Dinebito Wash, especially during snow on 2-year plan – culvert, bridge, feasibility study
- Maintain Existing Roads
- Helicopter Service

Open Space, Cultural Sites, and Grazing

- Protection of Grazing Areas
- Protection of Shrines, Eagle Nests, Burial Sites, Archaeological Sites
- Dryland Farming
- Probate – 190 Days
- District 5 Grazing Permits
- Dinebito Wash
- Black Falls

Housing

- Scattered Homes; Individual Homes at Own Site
- Affordable Housing
- Elderly Living Homes/ Disabled Group Homes

Education

- Navajo Language School
- Head Start; Elementary School; High School; Middle School; Buses
- Law Enforcement Programs (DARE)
- Financial Assistance for College/Scholarships

Phase 2 Projects: 5-10 Years

These are projects that realistically will take 5-10 years to get on the ground (WHP 2008h, pg. III-17-18):

Public Safety

- Fire Station located with Chapter Tract
- Ambulance Service in Tolani Lake, make accessible
- Health
- ER/Trauma Center
- Ambulance

Community Facilities

- Convalescence Center for Elderly
- Youth Center
- Legal Services/Office

Economic Development

- Laundromat
- Trading Post/Convenience Store/Gas
- Garage/Mechanics/Tire Store

Coop, Produce

- School Employment
- Gravel Pit Development
- Casino

Parks and Recreation

- Parks located on Chapter Tract (land withdrawn)
- Playground (Black Falls Church Area)
- Recreation Center; basketball outside, baseball fields

Open Space, Cultural Sites, and Grazing

- Irrigation Farming

Education

- Community Training Center

Phase 3 Projects: 10-15 Years

The following represents the project identified as part of Phase 3 Developments. This project should be considered part of future efforts to expand economic development opportunities for local residents, including providing additional jobs and adding on to existing livestock management knowledge and expertise (WHP 2008h, pg. III-18-19):

Public Safety

- Fire Hydrants for Cluster Homes within Total Community
- Crosswalks – safety issue for 6720
- Emergency Shelter within Community

Economic Development

- Fast Food/Restaurant
- Mobile Home Park
- Wal-Mart, pet store, pawn shop; auto dealership
- Man-made Lake

Transportation

- Airport

Parks and Recreation

- Tourist Center
- Rodeo Grounds
- Domed Sports Arena Center
- Horseback Trails
- Golf Course
- Outdoor Pool
- Pool Inside

Open Space, Cultural Sites, and Grazing

- Sub-Units, Range Management Plan
- Man-made Lake

Housing

- Rent-to-Own Housing and Programs
- Rentals
- Mobile Home Park
- Staff Housing (schools)
- NHA Residential Organization

Preferred Development Sites

Two sites were readily identified for site locations for housing within the Tolani Lake Chapter: the Tolani Lake Community and the Junction of Indian Routes 2 and 24 (WHP 2008h, pg. III-19).

Site #1 - Tolani Lake Community

The housing site proposed for development is 12 acres and is withdrawn by the NHA. There is water available on the site that comes from an existing NHA subdivision west of the site, but road access is poor from a single dirt road that is maintained. Slope is good for development in the area, varying from 5 percent to 2 percent, and drainage is decent due to sandy soils. In addition, electricity is available at the existing subdivision. There is no solid waste service in the area, but there is a landfill close by. There is an existing lagoon at Tolani Lake subdivision which would be utilized as the tie-in manhole, and it is approximately 100 feet away from the site (WHP 2008h, pg. III-19).

Site #2 - Junction Indian Route 2 and Indian Route 24

The housing site proposed for development is 10 acres, and is primarily used for grazing. There are also adjacent sites of commercial, industrial, community service, and rodeo grounds that have been designated. There is water availability across Indian Route 2 and the road access is excellent. The slope of the site is also good for development varying from 5 percent to 2 percent, and drainage is decent. There is electricity available across the major roads. Solid waste service is not present in the area, but there is a landfill close by. To achieve the proposed development, a new lagoon would have to be constructed (WHP 2008h, pg. III-20).

2.7.8 Tonalea Chapter

This Chapter includes the community of Tonalea. It is bordered by the Kaibeto, Inscription House, Shonto, Tuba City, Navajo Nation, and to the south it is bordered by the Hopi Reservation. Approximately 33% (49,925 acres) of the Chapter is located within the FBFA (WHP 2008i, pg. I-1).

Tonalea Chapter Physical Setting

The Chapter is located in northern Arizona, Coconino County and encompasses about 150,738 square miles. The Chapter itself lies on a plateau, and is located south of White Mesa and west of Black Mesa. Chapter elevations range from 7,260 feet on White Mesa to 6,011 feet near Red Lake (WHP 2008i, pg. 1-5). Nearby attractions include Grand Canyon to the west.

Tonalea Chapter Land Status

The southern portion of the Chapter is located in the FBFA, and as a whole is comprised of trust land with no private holdings (WHP 2008i, pg. 2-26). The Chapter lies in Grazing District 1, Range Unit 1 of the BIA Navajo Western Agency, Branch of Natural Resources (WHP 2008i, pg. 2-27).

Tonalea Chapter Land Use

The Chapter is primarily open space utilized for grazing. There is a lack of ranger stations within the Chapter that has resulted in insufficient range enforcement, and many people with grazing permits fear that their livestock may be stolen due, and others fear that lack of enforcement will lead to overgrazing as people exceed their limit on livestock. There is a lack of range preservation programs and public education throughout the Chapter, particularly in the FBFA, which has resulted in deteriorating conditions, such as overgrazing and land deterioration (WHP 2008i, pg. 2-26).

Farming, ranching and sheep herding is a major occupation and, a way of life in the Chapter and has been for many years, and has strong connections to the customs and cultural heritage of Chapter members. Tonalea Farms encompasses approximately 90 acres and was established in 1982 (WHP 2008i, pg. 2-29).

Tonalea Chapter Population and Housing

According to the 2000 U.S. Census the population for the Chapter was 2,537 individuals. The Chapter had a population of roughly 8,700 as of the 2000 census (WHP 2008i pg. 2-3). The population for 2010 was estimated at 2,945, and the 2020 is estimated to be around 3,419 (WHP 2008i, pg. 2-1). Fifty-four percent of the Chapter population includes individuals 24 years or younger, indicating that the Chapter is and will continue to experience a surge of young individuals and families in the future (WHP 2008i, pg. 2-5).

There is 753 housing units found within the Chapter, and the majority of these homes are owner-occupied (89%). Sixty-three percent of these homes were built after 1980, and the median year for structures built in the Chapter was 1985 (WHP 2008i, pg. 2-8-9).

Homes vary among detached homes and mobile homes. The majority of homes are heated from portable petroleum and wood, and 73 percent Chapter members do not have telephone service available. Fifty seven percent do not have plumbing facilities, and many homes are of poor construction quality, and many in the FBFA have become very run down due to the restrictions on improvements. Only 25 percent of homes are in good to very good condition, and 43 percent are in poor to very poor condition, according to field data conducted by WHPacific in 2008 (WHP 2008i, pg. 2-10).

There is a need for more housing options within the Chapter, and there is a deficient amount of clustered housing to serve young families and to meet the needs of the expanding population, but the Chapter has selected a site for future housing. People who wish to move back to the Chapter will need individual home sites within the FBFA, which will impact any grazing in the area (WHP 2008i, pg. 2-12).

Tonalea Chapter Government and Utility Infrastructure

The current water system in Tonalea Chapter was designed and constructed by the Indian Health Service (IHS), but is currently owned and operated by the Navajo Tribal Utility Authority (NTUA). The water source comes from the N-aquifer, which services the Tonalea and Cow Springs communities and scattered home sites along Highway 160. IHS anticipates to bring water to 171 additional homes in the Chapter's White Mesa area (WHP 2008i, pg. 2-33).

There is an ongoing issue of people drinking water from windmills due to the remoteness of some scattered-site housing, and this could put people at risk for bacterial contamination and air-borne contaminants due to the presence of livestock, as well as vandalism due to remote, unsupervised locations. It is anticipated that to address these issues, the Chapter will provide safe drinking water sources closer to these remote homes, a centralized drinking water truck delivery system, and/or improving the water quality testing and treatment of all water sources, including windmills and earthen dams (WHP 2008i, pg. 2-35).

Tonalea and Cow Springs are connected to a wastewater system, but White Mesa is not. Many of the homes in the Chapter use septic systems to handle wastewater, which sometimes pose environmental risks, and this issue is primarily due to the remoteness of residences (WHP 2008i, pg. 2-36).

A main transmission line runs east to west in the Chapter, and provides electricity to White Mesa, Cow Springs, and Tonalea communities. More than 60 percent of homes in the chapter are connected to electric infrastructure, and these utilities are built and maintained by NTUA (WHP 2008i, pg. 2-38). Propane gas is used in the community to supplement and reduce electric costs for heating and cooking purposes, since natural gas is not available in the Chapter. Currently, there are no plans underway to expand telephone lines, and lines are available only to the Chapter House and the NHA subdivision, with seven pay phones in the community. Therefore cellular phone service has begun to replace the need for landline service in some cases. Trash collects in various areas of the Chapter and causes health hazards for some residents (WHP 2008i, pg. 2-39).

The Chapters are the local government on Navajo Nation, similar to county governments in some states. The Local Governance Act was passed in 1996 to give more power to Chapter governments (WHP 2008j, pg. 57). The Navajo Nation Council maintains ultimate authority on most matters. The three steps outlined in the Act Chapters must follow for increased local authority are: (1) creating and adopting a community land-use plan (CLUP); (2) implementing a five-step system of financial accountability and management; and (3) becoming certified. Each Chapter consists of three elected officials: President, Vice President, and Secretary/Treasurer.

The Navajo Tribal Utility Authority (NTUA), a nonprofit corporation, oversees most utilities on Navajo Nation, including water, natural gas, and electricity. NTUA administers water and wastewater under the auspices of Indian Health Services. NTUA is overseen by a management board under the Navajo Nation Economic Development Committee. Utility prices are determined by an operating tariff set by the management board. Rates are set reservation-wide. The criteria for wastewater services and residences include existing plumbing systems and proximity to a main sewer line (WHP 2008j, pg. 75–76).

NTUA purchases power from multiple power companies and does not produce its own commercial power. NTUA builds and maintains transmission and power lines across the Nation (WPH 2008a, pg. 80). NTUA has the goal of providing power to all residences on the Reservation, but this is difficult largely due to the expanse of land area and scattered residences, often miles from the nearest power line tie-in. To a lesser extent, NTUA installs solar and wind power structures for electrical power generation at residences. NTUA purchases natural gas from outside the Nation. Propane is purchased from private companies.

The Navajo Nation Telecommunications Regulatory Commission manages telephone services, including cellular. NTUA is in the process of designing a fiber optics system that will increase internet access across the Nation. Frontier Communications provides business and residential services for satellite and cable television, land-line telephone, and internet. It leases tower spaces to private cellular companies. There are various options for cell phone providers for locals.

Transportation is managed by the Navajo Department of Transportation (NDOT). NDOT is under the Division of Community and Development, which is under the Transportation and Community Development Committee (TCDC) of the Navajo Nation Council (WHP 2008j, pg. 85). NDOT helps manage the airport in Tuba City. The Navajo Indian Reservation Roads (IRR) Program is administered by the BIA Navajo Area Branch of Roads. Indian Reservation Roads are public roads providing access to various parts of the Reservation. Arizona Department of Transportation (ADOT) manages U.S. Highways and State roads.

Tonalea Chapter Environmental Safety Status

The Chapter suffers from past uranium mining, resulting in contaminated water and health problems (WHP 2008i pg. 1-5). A study is underway to inventory uranium contamination sites throughout the region and develop a strategic plan to remedy environmental health hazards (WHP 2008i, pg. 4-10).

Tonalea Chapter Water

Surface Water

Ephemeral washes drained by this Chapter include Behashibito Wash, Shonto Wash, and other unnamed water channels, which flow in a southwest direction toward Red Lake. These washes flow in response to seasonal precipitation events and snow-melt, and most of the year they are dry creeks. They join near Red Lake at the southern end of the Chapter, which is an ephemeral lake that fills only during heavy runoff (WHP 2008i, pg. 2-31). The Chapter is located within the Moenkopi Wash Subbasin, Little Colorado Basin, Subregion, and Lower Colorado Region.

Ground Water

Groundwater in the area of the Tonalea Chapter is part of the Navajo (N) aquifer system, which is found mainly in the Navajo Sandstone. Wells that tap the N-aquifer range from 251 feet to 1,052 feet in depth according to the Navajo Nation Water Resource Management Branch. Wells within the Tonalea community range in depth from 504 feet to 960 feet, and from 251 feet to 550 feet within Cow Springs. There are no wells located near the proposed residential site in White Mesa community (WHP 2008i, pg. 2-33). This aquifer is estimated to store 290 million acre-feet of water, and has some of the better quality water of all the aquifers on the Nation (WHP 2008j, pg. 33). However, approximately 1.5 and 3 billion gallons in the N-aquifer are reported to be contaminated from past Uranium mining (WHP 2008j, pg. 45).

Wetlands and Floodplains

There are no flood plain maps or historical surface water flow data available for most of these areas, nor is there evidence of wetland conditions in the Chapter. Flood plain boundaries have not been determined by federal, state, or tribal entities. An inquiry with the Federal Emergency Management Agency in 2016 revealed that the Flood Insurance Rate Map (FIRM) for the unincorporated areas of Coconino County, Arizona, dated June 5, 1997, showed that all areas of the Navajo Indian Reservation have not been mapped for flood plain hazards (WHP 2008i, pg. 2-31).

Water Rights

The Water Management Branch of the Department of the Water Resources, under the Division of Natural Resources, oversees water on Navajo Nation. The Water Code Administration, part of the Water Management Branch, regulates water on Navajo Nation. It is responsible for implementation of the Navajo Nation Water Code, administers well drilling and water-use permits, resolves water use disputes, and generates revenue for the use of water for construction, industrial, government, and commercial purposes. The Navajo Nation EPA oversees surface and groundwater quality and issues 401 certifications under the Clean Water Act for impacts on Tribal Trust lands. The Navajo Nation EPA is in charge of public water system regulation through inspection, monitoring, and enforcement. Water rights in the Chapter need to be secured to help ensure that the communities can prosper

Chapter Water Needs

Water storage, transportation, and disposal are under developed across much of the Chapter. Many sources of water may be suitable for livestock but do not meet water quality standards for human consumption. Many homes are not connected to municipal water, and due to their distance from waterlines, this is unlikely to happen in the near future. The installation of additional watering points is one option. This will decrease the distance many residences would need to haul water. Septic systems are in need of improvement and/or maintenance in many areas. As with many places in the Southwest, major water supply projects and infrastructure designed to transport water from other, reliable and sustainable sources are needed for high levels of urban or agricultural development in the Chapter.

Tonalea Chapter Agricultural Resources

Agriculture in the Chapter is mainly restricted to livestock raising and ranching, and sheep and cattle are the main livestock raised. Grazing permits are required for livestock; and BIA sets the stocking rates. Jobs classified as agriculture, which are lumped with mining, comprise less than 0% of total jobs in the Chapter (WHP 2008i, pg. 2-15). Farming occurs at small scales and is rarely commercial large scale, being limited by a lack of perennial surface water.

Tonalea Chapter Soils

The area below White Mesa and Black Mesa, as well as the areas under evaluation, are part of the Sheppard-Fruitland-Rock Outcrop Association, which consists of somewhat excessively drained and well-drained soils and rock outcrop on plains and plateaus. The plains are broken by prominent mesas, buttes, and escarpments, and steep, rock-walled canyons form the sides of the drainages that traverse the areas. The soils were formed in aeolian sandy material weathered from sandstone and shale. Fruitland soils make up about 35 percent of the association, Sheppard soils make up about 35 percent, rock outcrop about 15 percent, and minor areas of associated soils and dune land and Badland about 15 percent. The minor soils are typically small areas of Moenkopie, Shalet, and Palma. The dune land occurs as scattered areas of low, poorly stabilized dunes of eroded shaly materials, which pose few limitations for home site development. The sandy texture of the Sheppard soils, however, is a severe limitation to shallow excavations (WHP 2008i, pg. 2-31-32).

Tonalea Chapter Biological Resources

Threatened and Endangered Species and Resource Protection Zones

The Chapter contains two ranked sensitivity areas classified in the Navajo Biological Resource Land Clearance Policies and Procedures (RCP). Area 3 (low sensitivity) covers the most area, followed by Area 1 (high sensitivity). There are no designated critical habitats for federally listed species protected under the Endangered Species Act (ESA) in the Chapter.

There are at least 12 species listed on the Navajo Nation Endangered Species list either occurring or with potential to occur in the Chapter. Species that are also protected under the ESA include black-footed ferret, Southwestern Willow Flycatcher, Welsh's milkweed, and Kanab ambersnail. Most native birds occurring in the Chapter are protected under the Migratory Bird Treaty Act; Bald and Golden Eagles are protected under their own federal law. Navajo Nation provides additional special protection for raptors.

Tonalea Chapter Mineral Resources

Uranium was the dominant mined mineral in the area through the nuclear boom in the 20th Century. The Navajo Abandoned Mine Lands (AML) Reclamation Department is tasked, with aid from the U.S. Department of Energy, in cleaning up hundreds to thousands of abandoned mines across the Nation.

Large-scale coal mining occurs outside the Chapter to the east on the Black Mesa/Kayenta mining complexes. Oil and gas exploration is increasing on parts of Navajo Nation with the expanse of hydraulic fracturing technology, but the Chapter has yet to a boom as has occurred in New Mexico portions of the Reservation.

Tonalea Chapter Cultural and Traditional Resources

Sensitive cultural areas include historic sites, such as old home sites, and prehistoric sites. Areas of Avoidance are also protected. These include areas used for gathering plants and materials used for traditional purposes. Specific locations of known archeological sites and previous project locations are not available to the public. Many areas on the Nation are not inventoried for cultural resources until the area is within the footprint of a planned project or development. Cultural resources are overseen by the Navajo Nation Historic Preservation Department, which keeps records of documented sites.

FBFA chapters have noticed activities that threaten culturally sensitive areas and fragile environments. For instance, four-wheelers drive uninhibited through Chapter lands and tourists have been removing artifacts from Chapter land. These types of activities can do irreversible damage to culturally significant areas and environmentally sensitive areas, and it is critical that this be addressed in order to prevent them in the future (WHP 2008i, 2008).

The Development Plan

The following sections outline the Tonalea Development Plan (WHP 2008i pg. 3-1–3-15).

Chapter Vision

The Chapter vision involves maximizing the benefits of modern opportunities while maintaining the integrity of traditional Navajo culture. The Chapter is ready to look and move forward in a

positive direction and leave the negative effects of the FBFA behind. Local empowerment is crucial to this.

Chapter Goals

Goals outlined in the 2008 Tonalea CLUP (WHP 2008i pg. 3-2–3-3) to reach the Chapter vision include:

- Access to safe and adequate housing
- A range of housing options that match all income ranges and location preferences
- Community facilities and services
- Off-the-grid utilities for homes, including wind and solar power and local drinking water
- Improved infrastructure in the community, including water, electricity, waste management, and cellular communications
- Independent living centers for elderly and disabled
- Economic development through retail and recreation for tourists, grocery stores, casinos, resorts, and commercial development
- Improved and well-maintained roads
- Continued ranching via improved range management

Development Issues

The following outline the principal development issues for the Chapter, as specified in the Tonalea CLUP (WHP 2008i, pg. 3-3–3-4):

- People unmotivated toward land development—Many residences have grazing permits and may not support land development.
- Incomplete and inconsistent residential planning—Many families have moved away. Obtaining new housing can be difficult due to funding, site requirements, and limited homesites. Political will can be lacking.
- Absence of youth advocates—Gap between adult traditions and youth expectations. Many youth do not speak the native language. There are too few youth to justify building a new school.
- Restricted lands prevent effective land use—Developing land as specified in the CLUP is difficult dud to bureaucracy and complacency. Grazing permit holders are resistant.
- Limited funding—Funding is limited and difficult to obtain. Chapters compete for funding, and more experienced or successful chapters tend to get funds.
- Unavailable data on former Bennett freeze area victims—The post-freeze process and discrepancies during the freeze are unclear to the Chapter.

Strategic Directions

Following are strategic directions outlined by the Chapter to achieve goals, as outlined in the Tonalea CLUP (WHP 2008i, pg. 3-4–3-5):

- Reforming the education system—A new public school with encouraged enrollment.
- Empowering and engaging community involvement—Job training with community input.
- Analyzing and initiating for compensation for victims of FBFA—Policy for bringing back displaced victims and compensation.
- Advocating, positioning, and dynamic visionary leader—A victim committee with leader.
- Engaging and enhancing youth involvement—A youth representative and organization.
- Redirecting utilities to FBFA—Flexible plan for utility development.
- Modifying and mandating land management regulations—Less restrictive grazing polices.
- Launching professional services and development—Contracting professional services for development.

Development Principles

The following principles should guide development:

- Sustainable construction should be required for all new buildings.
- New housing and commercial developments should be built near necessary resources.
- New developments should not harm the natural environment or negatively impact traditional ways of life.
- Fencing around homes and cornfields will help keep cattle away from property that is easily damaged.
- Creating jobs and improving the educational system and facilities to encourage younger generations from leaving and encouraging them to return.

Community Needs Assessment

The community needs assessment includes resource needs, identification of specific actions, and projects that need to be implemented in the FBFA, project phases by timeline, and preferred development sites within the Chapter.

Community Resource Needs were identified and divided into the following areas (WHP 2008i, pg. 3-7–3-10)

- Infrastructure and utility needs, including cellular communications, water tanks and windmills, water storage, safe drinking water, and reliable power sources (on and off grid)
- Transportation needs, mainly improved roads but possible an airstrip
- Housing needs, including improving existing homes and quality new homes of a variety of types and locations (e.g., scattered and clustered)
- Health and public safety needs, including faster emergency response time, closer emergency facilities, and physical addresses for homes

- Community facilities, parks, and recreation needs, including senior centers, child facilities, community centers, recreational facilities, and an improved chapter house
- Economic development needs, based on a diverse economy with multiple job and educational opportunities
- Education needs, including a middle and high school,
- Open space, areas of avoidance, and grazing needs, mainly improved range and farm management

Priority Capital Improvement Projects

The following represent the Chapter's preferred projects:

Priority	Actions
1	New Housing for Everyone—regardless of race, age, gender, employed, unemployed—compensate us for 50+ years
2	Health Care—Nursing Home
3	Dental & Health Clinic
4	Rebuild existing homes—Community Facilities
5	Supermarket
6	Auto Shop
7	Veterans center
8	Bigger Laundromat
9	Job Corps Office
10	Bank

Proposed Infrastructure Projects

Feasibility studies will be conducted for any proposed improvement project being considered. The project will be included in the current year's Capital Improvements Plan for consideration. Infrastructure projects will be coordinated with tribal and federal plans. Public facilities will be based on those approved in the CLUP unless amendments are made.

Priority Project Phasing

Following is the phasing plans of projects by priority.

Phase 1 Projects: 1–5 Years

- New Home for Everyone
- Rebuilt house and Hogan for existing homes
- Housing for veterans
- Retrofit for solar, wind energy, utilities
- All utilities hooked up to housing

- Rehab housing for handicapped
- Furniture for all housing
- Develop a master plan for utilities and infrastructure to develop land
- Utilities extension—6 phases
- Power line construction—Phase 6
- Waterline extensions
- Telephone Line extension—White Mesa included
- Individual Project Participation—S and SW of Wildcat Peak Area
- Nursing Home
- On-line educational courses—community college, etc.
- Adult Education—daycare center, preschool
- Public Library
- New School Building or addition
- Tourism Center
- Build Business building infrastructure for local people to lease: auto shop/repair, tire shop, car wash. Grocery stores, laundromat, barber shop, fast food, restaurant
- Develop recreation areas
- Gravel pit
- Farming/agricultural/irrigation development
- Pave roads: N211, N212, N213
- Traffic light at intersection Hwy 160 and N21
- 55 MPH signs before 45 mph signs
- Job Corps office
- Police Station/jail
- Fire station
- Juvenile Detention center
- Daycare
- Child Protective Services
- Safety training/community emergency response team/drivers education
- Certify land use plan
- Land use plan components—reserve sacred sites, preserve historical landmarks
- Bury utilities in open spaces, plan water use and conservation
- Fund/develop range management plan

Phase 2 Projects: 5–10 Years

- Health clinic
- Centenarian clinic/Dog Pound/humane shelter
- Recreation Center
- High School

- WIC Office
- Super market
- Art & Crafts center
- Visitor Center
- Convention Center
- Industry
- Veteran Center
- Exploration for natural resources: gas, oil, etc.

Phase 3 Projects: 10–15 Years

- Signage
- Transit System between Red Lake, Tuba City, Page, and Flagstaff
- Community bank
- Limit light pollution in open spaces

Preferred Development Sites

The following are the community's preferred development sites, including locations, size, and potential issues:

Site 1—Along Navajo Route 21, about ½ mile from Highway 160, north of the existing NHA site. About 49 acres. No drainages but natural depression may pool water. Accessible. Already has access to water and wastewater. Has all needed infrastructure.

Site 2—In White Mesa community along Navajo Route 21, on the southwest corner of Navajo Route 213. 97 acres. No drainages but one about 300 feet to northwest. Accessible. Indian Health Services can connect site to water but not wastewater.

Site 3—In Cow Springs community west of NHA subdivision. 20 acres. About 2,500 feet from Highway 160 via dirt road. Flatt topography. No drainages, but some to east and west. Less accessible than Sites 1 and 2. Already has access to water and wastewater.

2.7.9 Tuba City Chapter

This Chapter includes the community of Tuba City. It is bordered by the Tonalea, Kaibito, Coppermine, Bodaway, and Coalmine Mesa Chapters, Navajo Nation. It is also bordered by the Hopi and San Juan Paiute Indian Tribes. One hundred percent of the Chapter's 13,440 acres is within the FBFA. The community portion of Tuba City was classified as an administrative area and was exempt from the development and rehabilitation restrictions of the Bennett Freeze (WHP 2008j, pg. 1-5).

Tuba City Chapter Physical Setting

Known as To'Nanees'Dizi, (meaning scattered or tangled water), the Tuba City Chapter is located in Coconino County, AZ. Tuba City itself is located not far off U.S. Highway 89 on U.S. Highway 160, near the junction of these two highways. Nearby attractions include Grand Canyon to the west. Tuba City is crossed by two different time zones.

Tuba City Chapter Land Status

The Chapter consists of one community, while the majority of the Chapter is open space used for grazing (WHP 2008j, pg. 2-33–34). The Chapter is within Grazing District 3 Range Unit 2, which is within the Tuba City Western Agency. The Chapter is comprised of trust land with no private holdings.

Tuba City Chapter Land Use

Approximately 95 percent of the Chapter's land use is dominated by cattle and sheep grazing (WHP 2008j, pg. 2-33). There are perhaps 100 permittees currently. Overgrazing has affected the land in many areas due to lack of management plants, regulation, and enforcement. Soil erosion and changes in vegetation composition have resulted. Other impacts include damage to cultural and home sites.

Tuba City Chapter Population and Housing

The Chapter had a population of roughly 8,700 as of the 2000 census (WHP 2008j, pg. 2-3). The 2010 US Census lists the Chapter all-race population as 9,265 individuals (Navajo Division of Health and Navajo Epidemiology Center 2013). The population for 2020 is estimated to be around 12,000 (WHP 2008j, pg. 2-3).

The Chapter is one of the more urbanized areas on Navajo Nation due to Tuba City. There were 2,644 housing units as of around 2008 (WHP 2008j, pg. 2-10). Homes vary among detached homes and mobile homes. A 2006 survey found that 44% of tribal members live on a homesite lease, 19% in modular homes, and 18% in subdivisions. The majority of homes are heated from portable petroleum and wood. Roughly 25% of homes do not have plumbing (WHP 2008j, pg. 2-12). The Chapter has identified four areas for future housing development. These areas would likely consist of clustered housing, which tends to appeal more to younger people. WHP Inc., found in 2008 that 22% of homes in the Chapter are in poor to very poor condition, and 8% in good to very good condition (WHP 2008j, pg. 2-14).

The Navajo Housing Authority, working under the Native American Housing Assistance and Self Determination Act, works to construct affordable housing for low-income families (WHP 2008a, pg. 73). The Housing Authority also works to increase and plan community development in sustainable ways including job training, substance abuse prevention, and local employment, among others.

The Community Housing and Infrastructure Department oversees the Navajo Housing Authority and also works toward community development. The Department works with government agencies, outside utilities, the private sector, and nonprofits toward housing and community development. There are over 15 government and private sector housing assistance programs (mostly loans and grants) available to the Tribe and Native Americans (WHP 2008a, pg. 280–284).

Tuba City Chapter Government and Utility Infrastructure

The Chapters are the local government on Navajo Nation, similar to county governments in some states. The Local Governance Act was passed in 1996 to give more power to Chapter governments (WHP 2008a, pg. 57). The Navajo Nation Council maintains ultimate authority on most matters. The three steps outlined in the Act Chapters must follow for increased local authority are: (1) creating and adopting a community land-use plan (CLUP); (2) implementing a five-step system of financial accountability and management; and (3) becoming certified. Each Chapter consists of three elected officials: President, Vice President, and Secretary/Treasurer.

Tuba City is a certified Chapter under the Local Governance Act. The Chapter has modified its government from that of the traditional chapter governance. The Chapter has the same elected officials as described above but also has the Council of Nat'aa, with up to six Council members. There is also an appointed Atsilasdai Executive (Chapter Services Coordinator; WHP 2008a pg. 57–58).

The Navajo Tribal Utility Authority (NTUA), a nonprofit corporation, oversees most utilities on Navajo Nation, including water, natural gas, and electricity. NTUA administers water and wastewater under the auspices of Indian Health Services. NTUA is overseen by a management board under the Navajo Nation Economic Development Committee. Utility prices are determined by an operating tariff set by the management board. Rates are set reservation-wide. The criteria for wastewater services and residences include existing plumbing systems and proximity to a main sewer line (WHP 2008a, pg. 75–76).

NTUA purchases power from multiple power companies and does not produce its own commercial power. NTUA builds and maintains transmission and power lines across the Nation (WHP 2008a, pg. 80). NTUA has the goal of providing power to all residences on the Reservation, but this is difficult largely due to the expanse of land area and scattered residences, often miles from the nearest power line tie-in. To a lesser extent, NTUA installs solar and wind power structures for electrical power generation at residences. NTUA purchases natural gas from outside the Nation. Propane is purchased from private companies.

The Navajo Nation Telecommunications Regulatory Commission manages telephone services, including cellular. NTUA is in the process of designing a fiber optics system that will increase internet access across the Nation. Frontier Communications provides business and residential services for satellite and cable television, land-line telephone, and internet. It leases tower spaces to private cellular companies. There are various options for cell phone providers for locals. Wireless internet is available at the Tuba City Chapter House.

Transportation is managed by the Navajo Department of Transportation (NDOT). NDOT is under the Division of Community and Development, which is under the Transportation and Community Development Committee (TCDC) of the Navajo Nation Council (WHP 2008a, pg. 85). NDOT helps manage the airport in Tuba City. The Navajo Indian Reservation Roads (IRR) Program is administered by the BIA Navajo Area Branch of Roads. Indian Reservation Roads are public roads providing access to various parts of the Reservation. Arizona Department of Transportation (ADOT) manages U.S. Highways and State roads, including the two U.S. Highways in the Tuba City Chapter.

Water in the Tuba City Chapter is distributed by a municipal water supply; however, many residences rely on hauling water or cistern storage. Many people rely on water from windmills, which is often unsafe for human consumption.

Tuba City Chapter Environmental Safety Status

The Chapter suffers from past uranium mining, resulting in contaminated water and health problems (WHP 2008j, pg. 1-5). Abandoned septic tanks and water quality are also problematic in remote areas.

Tuba City Chapter Water

Surface Water

Surface water in the area is predominately from ephemeral flow in arroyos and canyons resulting from rain and snowmelt runoff. Natural springs occur in places, but these do not create perennial streams. Surface water may be captured in small impoundments for livestock. The Chapter is located within the Moenkopi Wash Subbasin, Little Colorado Basin, Subregion, and Region.

Ground Water

The Tuba City Chapter is underlain by the N-aquifer. This aquifer is estimated to store 290 million acre-feet of water, and has some of the better quality water of all the aquifers on the Nation (WHP 2008a, pg. 33). However, approximately groundwater 1.5 and 3 billion gallons in the N-aquifer are reported to be contaminated from past Uranium mining (WHP 2008a, pg. 45).

Wetlands and Floodplains

Floodplains in the Tuba City Chapter are currently classified by FEMA as Areas of Undetermined Flood Hazard. Most potential flooding would occur along washes during

unusually high water caused by flash floods or prolonged heavy rains. Some areas, such as greasewood habitats, may commonly pool water during and after storms.

Natural wetlands are rare in the area. Wetlands may have been created from wastewater disposal in some areas or below reservoirs or impoundments. Areas within the Chapter mapped by the National Wetlands Inventory include Greasewood Lake (mapped as a lake), and ponds and small wetlands in and around Tuba City, all likely human made. Other small wetlands and riparian areas are mapped along Moenkopie Wash and several natural springs east of Hamblin Wash.

Water Rights

The Water Management Branch of the Department of the Water Resources, under the Division of Natural Resources, oversees water on Navajo Nation. The Water Code Administration, part of the Water Management Branch, regulates water on Navajo Nation. It is responsible for implementation of the Navajo Nation Water Code, administers well drilling and water-use permits, resolves water use disputes, and generates revenue for the use of water for construction, industrial, government, and commercial purposes. The Navajo Nation EPA oversees surface and groundwater quality and issues 401 certifications under the Clean Water Act for impacts on Tribal Trust lands. The Navajo Nation EPA is in charge of public water system regulation through inspection, monitoring, and enforcement.

Chapter Water Needs

Water storage, transportation, and disposal are under developed across much of the Chapter. Many sources of water may be suitable for livestock but do not meet water quality standards for human consumption. Many homes are not connected to municipal water, and due to their distance from waterlines, this is unlikely to happen in the near future. The installation of additional watering points is one option. This will decrease the distance many residences would need to haul water. Septic systems are in need of improvement and/or maintenance in many areas. As with many places in the Southwest, major water supply projects and infrastructure designed to transport water from other, reliable and sustainable sources are needed for high levels of urban or agricultural development in the Chapter.

Tuba City Chapter Agricultural Resources

Agriculture in the Chapter is mainly restricted to livestock raising and ranching. Sheep and cattle are the main livestock raised, although some people also keep horses for transportation and ranching. Grazing permits are required for livestock; BIA sets stocking rates. Jobs classified as agriculture, which are lumped with mining, comprise less than 3% of total jobs in the Chapter (WHP 2008j, pg. 2-21). Farming occurs at small scales and is rarely commercial large scale, being limited by a lack of perennial surface water.

Tuba City Chapter Soils

The Natural Resource Conservation Service (NRCS) has completed a soil inventory of the Chapter. The Chapter contains approximately 26 mapped soils units (NRCS 2013). Six of these soil units comprise the majority of soils in the Chapter. These are: Arches–Rock outcrop–Mido complex, two to fifteen percent slopes; Mespun–Councelor–Mespun, limy substratum complex, zero to ten percent slopes; Santrick–Nalcase–Rock outcrop complex, one to fifteen percent slopes; Sheppard–Psammaquents–Rock outcrop complex, zero to eight percent slopes; Sheppard–Rock outcrop–Sheppard, moderately deep complex, two to fifteen percent slopes; and Tuba–Tyende family–Fajada family complex, two to fifteen percent slopes. The dominant geology in the area is from the Glen Canyon Group, consisting of Navajo Sandstone, Kayenta and Moenave Formations, and Wingate Sandstone.

Tuba City Chapter Biological Resources

Threatened and Endangered Species and Resource Protection Zones

The Chapter contains all four ranked sensitivity areas classified in the Navajo Biological Resource Land Clearance Policies and Procedures (RCP). Area 3 (low sensitivity) covers the most area, followed by Area 1 (high sensitivity), then Areas 2 and 4 (moderate and developed community). There are no designated critical habitats for federally listed species protected under the Endangered Species Act (ESA) in the Chapter.

There are at least 12 species listed on the Navajo Nation Endangered Species list either occurring or with potential to occur in the Chapter. Species that are also protected under the ESA include black-footed ferret, Southwestern Willow Flycatcher, Welsh's milkweed, and Kanab ambersnail. Most native birds occurring in the Chapter are protected under the Migratory Bird Treaty Act; Bald and Golden Eagles are protected under their own federal law. Navajo Nation provides additional special protection for raptors.

Tuba City Chapter Mineral Resources

Uranium was the dominant mined mineral in the area through the nuclear boom in the 20th Century. The Navajo Abandoned Mine Lands (AML) Reclamation Department is tasked, with aid from the U.S. Department of Energy, in cleaning up hundreds to thousands of abandoned mines across the Nation.

Large-scale coal mining occurs outside the Chapter to the east on the Black Mesa/Kayenta mining complexes. Oil and gas exploration is increasing on parts of Navajo Nation with the expanse of hydraulic fracturing technology, but the Chapter has yet to a boom as has occurred in New Mexico portions of the Reservation.

Tuba City Chapter Cultural and Traditional Resources

Sensitive cultural areas include historic sites, such as old home sites, and prehistoric sites. Areas of Avoidance area also protected. These include areas used for gathering plants and materials used for traditional purposes. Specific locations of known sites are not available to the public. Many areas on the Nation are not inventoried for cultural resources until the area is within the footprint of a planned project or development. Cultural resources are overseen by the Navajo Nation Historic Preservation Department, which keeps records of documented sites.

The Development Plan

The following sections outline the Tuba City Development Plan (WHP 2008j, pg. 3-1–3-22).

Chapter Vision

The Chapter Vision involves maximizing the benefits of modern opportunities while maintaining the integrity of traditional Navajo culture. The vision is best summed up as:

"The TóNanees'Dizi Chapter shall be a chapter with both an urban and rural diversity. The rural area will continue to accommodate farming and the traditional Navajo way of life. The administrative area will be a community which is home to commercial activity and denser residential development. The community will have an approved land use plan which identifies the road network and delineates commercial and residential land uses. All residents of the Chapter, be they Dine or non-chapter members, will have access to safe and affordable housing and all basic infrastructures" (WHP 2008j, pg. 3-1).

Chapter Goals

Goals outlined in the Tuba City CLUP (WHP 2008j, pg. 3-1–3-2) to reach the Chapter vision include:

- Access to safe and adequate housing
- A range of housing options that match all income ranges and location preferences
- Elderly and disabled resident access to independent living centers
- Education opportunities for students of all ages
- Improved quality of life through economic development; retail and recreational opportunities for tourists
- Adequate public safety, including fire and police protection, for all residences
- A stable government that will work to improve the community and increase public participation
- Saving and protecting the environment, as this is a central concern for the community

Development Issues

The following outline the principal development issues for the Chapter, as specified in the Tuba City CLUP (WHP 2008j, pg. 3-3–3-4):

- Lengthy and cumbersome bureaucratic protocols
- No accountability to FBFA residents and Chapters
- Political contradictions and interferences
- Limited and restrictive resources
- Incomplete integration of technology
- Conflicting laws and mandates
- Diversity in culture and language
- Undervalued input and acknowledgement of FBFA residents

Strategic Directions

Following are strategic directions outlined by the Chapter to achieve goals, as outlined in the Tuba City CLUP (WHP 2008j, pg. 3-4–3-6):

- Implementing financial management plan—This will aid in transparency and put more money in the Chapter's control rather than the Navajo Nation Counsel.
- Implementing community-based land use plan—Strategic planning to empower local government.
- Strengthening governance through local empowerment—Putting more power in the Chapter's hands and removing dependency on the Navajo Nation Counsel.
- Involving impacted communities—A clear line of involvement and communication among FBFA communities, Navajo Nation, and the federal government.
- Using and integrating technology—For example, improved internet access.
- Establishing partnerships to address FBFA recovery—R residents do not trust their concerns will addressed by the Navajo Nation departments in charge of managing FBFA recovery. The number of intermediary departments and deal should be reduced, and one agency should be in charge of recovery.
- Preserving language and culture—Increasing use of native languages and encouraging cross-cultural sharing, especially with young people.
- Creating awareness through outreach and marketing—Informing, updating, and educating the public though continued outreach and public meetings.

Development Principles

The following principles should guide development:

- The Chapter should provide for people's basic needs such as power and water.

- The Chapter needs to plan for improving the overall health of its members.
- Public safety and emergency medical service need to be improved to better respond to emergency situations.
- The Chapter should commit to creating a stable and independent economy.
- New developments should not harm the natural environment or negatively impact traditional ways of life, including cultural resources.
- The Chapter needs to plan for jobs for the large and growing young population.

Community Needs Assessment

The community needs assessment is based on information provided by the community during community workshops in 2008 and by professional field assessments completed by WHPacific, Inc., in 2008 (WHP 2008j, pg. 3-6).

The community needs assessment includes resource needs, identification of specific actions, and projects that need to be implemented in the FBFA, project phases by timeline, and preferred development sites within the Chapter.

Community Resource Needs were identified and divided into the following areas;

- Infrastructure/utilities, including Power lines, waterlines, a wastewater treatment facility, and a solid waste collection infrastructure, cellular communications, and waste management
- Transportation, including road improvements, public transportation, and bike lanes
- Housing, including a diversity of housing types and communities, and repair of existing properties
- Health and public safety, including decreased emergency response time, physical home addresses, and access to pharmacies
- Community facilities, including parks, recreation areas, day care, community centers, updated rodeo and fair grounds, libraries, and computer labs
- Economic development, including employment opportunities, tourism industry, increased Native-owned business, and agriculture improvements
- Education, including life-long learning centers, vocational training, and four-year university
- Open Space, areas of avoidance, and grazing, including uranium mining cleanup and range management

Actions

Priority Capital Improvement Projects

The following represent the Chapter's preferred projects:

Priority	Action
1	New hospital w/trauma center and nursing home
2	Home ownership
3	Road improvement
3	NTUA/ APS—Rare Metal power line project
3	Install water and sewer lines along Hwy 160 to Hwy 89/ Main community area
3	New public safety and detention center—engineering, design plans, infrastructure & construction
3	Upgrade Fair/ Rodeo grounds, including bathrooms
4	Wal-Mart
4	Daycare for working families (in Admin area)
5	Adult education facility—university, vocation, technical and job corps
6	Relocated Navajo Housing Services
6	Public transit system—Bus route
7	Farmer's market
7	Tourist center
7	Kerley Valley construction
7	Bus route along name routes to be paved and maintained—same as road improve projects
7	Nursing home
8	Treatment/ Detox center
8	Waste water treatment plan (upgrade/expand the Kerley Valley w/treatment plan)
8	Feasibility study for Wind farm (location & operation)
8	Casino/ Bingo hall
8	One-stop shop for tribal programs
8	Pave Moenave Road
8	Main Street construction
8	Chapter Voter Boundary assessment
9	Animal shelter—expand and upgrade
9	Cemetery— community & veterans
9	Pave To NaneesDizi local government parking lot
9	Memorial marker remembering our leaders
9	Livestock control facility—impound lot, livestock management office
9	Range management plan—determine units
9	New shopping mall
9	Withdraw commercial and business zone along Hwy 160 (100 acres)
9	Feasibility study for ATV and quad track
9	Rural/911 addressing
9	Power line extension—Moenave phase 6 (33 homes/ Rare Metal)
9	Solar energy for remote homes
9	Pharmacy
9	Veterinarian

Proposed Infrastructure Projects

Feasibility studies will be conducted for any proposed improvement project being considered. The project will be included in the current year's Capital Improvements Plan for consideration. Infrastructure projects will be coordinated with tribal and federal plans. Public facilities will be based on those approved in the CLUP unless amendments are made.

Priority Project Phasing

Following is the phasing plans of projects by priority.

Phase 1 Projects: 1–5 Years

Economic Development

- Withdraw commercial and business zone along Hwy 160 (100 acres)
- Funds for future business infrastructure
- Convention and Conference Resort Center
- Commercial development—247 acres (including sub-division)—need for clothing stores, fine dining, grocery, coffee shop, and spa
- Relocate the ToNaneesDizi Indian Market
- Kerley Valley commercial & industrial site- infrastructure (water, waste, waterlines, and site prep)
- Rehab businesses for handicap accessibility

Public Safety

- New public safety and detention center—engineering, design plans, infrastructure and construction
- Rural/911 addressing
- Demolish existing Navajo Nation Tuba City Police department and Adult Detention Center
- Sub-police station
- Fire station at Moenave
- Sub-Emergency Medical Services

Health

- New hospital w/trauma center and nursing home
- Treatment/Detox center
- Pharmacy
- Veterinarian
- Emergency management center/office

Community Facilities

- Nursing home
- Chapter voter boundary assessment
- Animal shelter—expand and upgrade
- Cemetery—community and veterans
- Pave To'Nanees'Dizi local government parking lot
- Memorial marker remembering our leaders
- Livestock control facility – impound lot, livestock management office
- Animal boarding and veterinarian clinic
- One-stop shop for Navajo Nation programs
- Veterans' parking lot (some design completed)
- Women's shelter

Infrastructure Utilities

- Road improvement
- NTUA/APS—Rare Metal power line project
- Install water and sewer lines along Hwy 160 to Hwy 189/Main community area
- Waste water treatment plan (upgrade/expand the Kerley Valley with treatment plant)
- Power line extension—Moenave Phase 6 (33 homes/Rare Metal)
- Solar energy for remote homes

Transportation

- Public transit system – bus route
- Kerley Valley road construction
- Pave Moenave Road
- Street posting and lighting
- Carpool/taxi
- Colorado Street construction

Open Space, Cultural Sites, and Grazing

- Plant-a-tree program—wind control (SW Tuba and along Main Street)
- 100% uranium cleanup

Housing

- Homeownership
- Relocate Navajo Housing Services
- FBFA recovery infrastructure housing program—construction & wiring

- Apartment complex
- Subdivision housing 247 acres (including business)
- Habitat for Humanity
- Apartments for doctors and nurses
- Student housing

Education

- Daycare for working families (Admin area)
- Adult education facility—university, vocational, technical school and job corps (Admin area)
- Bus route along named routes (Paved & Maintained)—same as road improvement projects
- Retention fund for quality teachers, principals, board members and superintendents

Parks & Recreation

- Upgrade Fair/Rodeo grounds, including bathroom
- Dinosaur track tourist attraction (West Tuba)
- 4-H Club
- Relocate auction yard to rodeo grounds
- Bicycle trail (along Main Street/Hwy 160)
- Community baseball/softball field
- Boys & Girls facility
- New community and recreational center

Phase 2 Projects: 5–10 Years

Transportation

- Main Street construction
- Bike lane

Open Space, Cultural Sites, and Grazing

- Range management plan – determine units

Parks & Recreation

- RV park and campground (Kerley Valley at Auction Yard)
- Feasibility study for hiking and horseback riding trail location and operation

Phase 3 Projects: 10–15 Years

Community Facilities

- Renovate T'Nanees'Dizi Local Government meeting hall
- Infrastructure utilities
- Feasibility study for Wind Farm—location and operation
- Capture methane gas at Landfill for alternative fuel (SW Tuba)

Transportation

- Build bridge over highly used streets
- Hybrid transportation
- Railroad station

Parks & Recreation

- Feasibility study for ATV and quad track
- Feasibility study for fish hatchery farm
- Feasibility study for hiking and horseback riding trail location and operation
- Feasibility study for golf course with bingo hall
- Community swimming pool and aquatic center
- Health club

Chapter 3: Goals, Plans and Objectives for Resources

The Navajo Nation believes that an overall goal for strategic resource management is to restore and preserve these resources for future generations. Goals and management objectives associated with each resource are summarized below.

3.1 Cultural Resources

Preservation of irreplaceable cultural resources is essential to the continued well-being of the Navajo Nation. Cultural resources will be maintained and enriched for the Tribe's future generations. The cultural foundation of the Nation should be preserved as a living part of Tribal community life and development in order to give a sense of orientation to the Navajo people.

Cultural resources are managed by the NNHHPD included within the Division of Natural Resources. The Historic Department is responsible for protection, preservation, and management planning for historic, archaeological, and cultural resources on the lands of the Navajo Nation or on lands in which the Navajo people have a traditional interest.

Cultural Resource Goals

- Protect and restore cultural sites traditionally significant to the Tribe and to the FBFA communities.
- Identify and manage Navajo traditional and historical properties for future generations.
- Locate, evaluate, and protect or enhance cultural plants for use by tribal members.
- Locate, evaluate, and protect historical and archeological resources for management purposes.
- Educate tribal members and the local community about the traditional practices of the Navajo Tribe and the ways in which natural resources were utilize to provide for current and future communities.
- Support the protection, restoration, and utilization of culturally significant plant and animal communities.

Cultural Resource Management Goals

1. Provide for the protection, restoration, conservation, management, and sustainable development of Navajo natural resources under the guidance and direction of the people of the Navajo Nation and the Navajo Nation Council.
2. Ensure that the highest quality of natural resources are available for the enjoyment and use of present and future generations of Navajo people.
3. To coordinate with appropriate departments the development, recommendation, and implementation of rules and regulations governing effective and efficient resource management, preservation of cultural resources, and restoration of damaged resources.

3.2 Physical Resources

3.2.1 Water Resources

The Tribe employs an integrated approach to manage and protect water resources including surface water, groundwater, and drinking water. The Navajo Nation Department of Water Resources is included within the Division of Natural Resources.

Water Resource Goals

- The Department of Water Resources works to plan, coordinate, develop, and manage the water resources of the Navajo Nation for its maximum beneficial use and promote the sovereignty of the Navajo Nation over its waters.
- Provide administration and ensure compliance with all applicable laws, rules, regulations, policies and procedures related to the departments' administrative, technical and financial functions.
- Operates and maintains all livestock, irrigation, and domestic water facilities under its jurisdiction.
- The Department shall study, plan, design, construct, rehabilitate, and otherwise be responsible for providing engineering, geohydrological, drilling, and construction support to water development projects.
- The Department shall study, plan, design, monitor, construct, and rehabilitate/upgrade all recognized major dams on the Navajo Reservation.
- The Department shall protect and manage water resources of the Navajo Nation.
- The Department shall serve as a Navajo Nation repository for water and climate related data including reports, books, maps, government publications and other materials pertinent to the purpose of the Department.

Water Management Objectives

- Provide an overview of water supply and management on the reservation, including descriptions of the Tribal entities that play key roles.
- Describe water use and demand on the Navajo Nation.
- Based on current and future water demands, identify water infrastructure deficiencies.
- Propose a long-term water resource development strategy for the Navajo Nation.
- The Navajo Nation will work with the appropriate federal agencies, including but not limited to the Bureau of Indian Affairs (BIA), the Bureau of Reclamation (Reclamation), Indian Health Services (IHS), the Army Corps of Engineers, and the U.S. Department of Agriculture, to develop an interagency consensus on a Plan of Action to implement the strategy.

3.2.2 Noxious Weeds Management Goals

The BIA Noxious Weed program provides directives for improved range management on Indian lands and identify weed species of concern (BIA, 2014). This program has initiated efforts to

control specific target noxious weeds on the Navajo Nation (including FBFA) targeting the following noxious weeds:

Table 19: Noxious weed species identified in the Navajo Nation Integrated Weed Management Plan (2014) as species with limited distribution on the Navajo Nation.

Common Name	Species	Management Goal
Halogeton	*Halogeton glomeratus*	Contain & Long term eradicate
Siberian elm	*Ulmus pumila*	Contain & Long term eradicate
Camelthorn	*Alhagi camelorum*	Contain & Long term eradicate
Tamarisk, Saltcedar	*Tamarix ramosissima*	Contain & Long term eradicate
Diffuse knapweek	*Centaurea diffusa*	Contain & Long term eradicate
Russian knapweed	*Acroptilon repens*	Contain & Long term eradicate
Russian Olive	*Elaeagnus angustifolia*	Contain & Long term eradicate
Johnsongrass	*Sorghum halepense*	Contain & Long term eradicate

Table 20:Noxious weed species identified in the Navajo Nation Integrated Weed Management Plan (2014) as species with wide-spread distribution on the Navajo Nation.

Common Name	Species	Management Goal
Cheatgrass	*Bromus tectorum*	Local Contain & Monitor
Field bindweed	*Convolvulus arvensis*	Local Contain & Monitor
Jointed goatgrass	*Aegilops cylindrica*	Local Contain & Monitor
Puncturevine	*Tribulus terrestris*	Local Contain & Monitor
Rescuegrass	*Bromus catharticus*	Local Contain & Monitor
Ripgut brome	*Bromus diandrus*	Local Contain & Monitor
Smooth brome	*Bromus inermis*	Local Contain & Monitor
Bald brome	*Bromus racemosus*	Local Contain & Monitor
Red brome	*Bromus rubens*	Local Contain & Monitor
Spreading wallflower	*Erysiumu repandum*	Local Contain & Monitor
Horehound	*Marrubium vulgare*	Local Contain & Monitor
California burclover	*Medicago polymorpha*	Local Contain & Monitor
Russian thistle	*Salsola kali*	Local Contain & Monitor
Field brome	*Bromus arvensis*	Local Contain & Monitor
Kochia	*Bassia scoparia*	Local Contain & Monitor

Noxious Weeds Management Objectives

1. Develop the best control techniques described for the target weed species in a planned, coordinated, and economically feasible program to limit the impact and spread of noxious and invasive weeds.
2. Identify and prevent the expansion of existing infestations of target weed species, and quickly prevent the spread of new high priority weed species in the project area.

3. Coordinate weed removal efforts with adjacent land owners or managers to prevent the further spread of weed populations (i.e., State roads and Bureau of Land Management).
4. Provide and promote economic opportunities to the Navajo people by improving rangeland productivity and potentially providing economic opportunities to remove invasive plant species.
5. Develop a public education program focusing on weed identification, prevention, and removal techniques for the local communities and non-profit organizations.

3.2.3 Range

Livestock grazing is an important component of Navajo history, culture, lifestyle, and their economy. Vegetation resources on Navajo Nation are protected by the Navajo Nation Department of Fish and Wildlife within the Division of Natural Resources. Responsibility for vegetation resources on the reservation are shared by Navajo Nation Division of Natural Resources and BIA's Natural Resources division. The mission statement of the Western Navajo Nation Branch of Natural Resources is to maintain overall productivity of the grazing, farm, water and wildlife resources.

Range Goals and Objectives

1. To improve and enhance all resources in line with the "Sustained Yield" management concept and to achieve the highest return from the resource (range) on sustained yield basis.

3.2.4 Forestry

The Tribe understands that sustainable practices supported by the best available science is a mainstay of any forest management strategy. Navajo Forestry Department is tasked with managing the Nation's forests, including research and development, deforestation and disease control, timber and fire management. Plan, implement, coordinate, integrate, manage, and otherwise be responsible for all Navajo Nation programs designed to administer, develop, utilize, conserve, protect, and regenerate the forest resources of the Navajo Nation.

Forestry Goals

1. Manage and protect the Navajo Nation Forest/Woodland resources for the benefit and perpetual use of the Navajo people.
2. Collaborate with the Bureau of Indian Affairs, Forestry Branch to manage forest and woodlands on the Navajo Nation.
3. To collect and provide information on best management practices for management planning and forest development.
4. To prepare and administer timber sales on the Navajo Nation.

Forestry Management Goals

1. Protect the Navajo forest against damaging insects, disease, timber trespass, and wildfire.

2. Manage 4.8 million acres of piñon pine, juniper, and oak species on the Navajo Nation via the Research and Development Program.

3.2.5 Fish and Wildlife

The diversity of fish and wildlife on the Navajo Nation is important to the Tribe. Many of the species on the Reservation are only found on Navajo Tribal lands and have important cultural significance to the Navajo. The Navajo Nation Department Fish and Wildlife (within the division of Natural Resources) is dedicated to conservation of the rich and diverse fish, wildlife, and plant resources of the Navajo Nation. Additionally, the Department of Fish and Wildlife is in charge of developing and recommending policies, rules, and regulations, and management plans relating to the fish, wildlife, and native plant resources on the Navajo Nation; and to provide predator and animal control services on the Navajo Nation. The Fish and Wildlife Department consists of Wildlife Law Enforcement, Research & Management, Natural Heritage Program, Animal Damage/Animal Control Sections, and Zoological and Botanical Park.

Fish and Wildlife Management Objectives

1. Conserve, protect, enhance and restore the Navajo Nation's fish, wildlife, plants, and their habitat;
2. Conserve and protect species and habitats through management programs for the spiritual, cultural, and material benefit of present and future generations;
3. Operate and maintain the Navajo Nation Zoological and Botanical Park;
4. Enforce Navajo Nation animal control laws and regulations and provide animal control services within the Navajo Nation.

Wildlife species on the Navajo Nation and Bennet Freeze area are generally restricted to specific plant communities which fulfill their habitat preferences. The top 11 highest priority species (in alphabetical order) include American black bear, bobcat, Colorado River cutthroat trout, coyote, desert bighorn sheep, golden eagle, Gunnison's prairie dog, mountain lion, mule deer, Merriam's wild turkey, and Rocky Mountain elk.

Priority Species for Management

Black bear

Overexploitation and habitat loss have reduced populations of American black bears from their historical proportions. Currently threats to black bears include hunting, poaching, conflict with humans/human encroachment, and habitat loss and fragmentation due to human activities (Heinz Center 2011, Garshelis 2008). These anthropogenic disturbances have caused the black bear to expand its home range, and can be now be found in a variety of habitat types from high to low elevational ranges (Heinz Center 2011, Ulev 2007). The American black bear is also considered a species of cultural importance to the Navajo people.

Maintaining stable populations on the Navajo Nation for future generations and traditional purposes is the primary long-term goal for black bears intended by the NNDFW. This is intended to be accomplished by conducting research of population status, developing a monitoring program from the resulting research, and then establishing an active management program.

Bobcat

Habitat preferences for the bobcat include dense understory vegetation with shelters to hide or den in, and high prey density of their preferred diet which includes rabbits and other small mammals (Heinz Center 2011, Kelly et al. 2008). Habitat loss and fragmentation due to anthropogenic disturbance is the primary threat to bobcats. The bobcat is not considered a species of cultural value to the Navajo people.

Colorado River Cutthroat Trout

Primary threats to the Colorado River cutthroat trout includes land management practices, fragmentation and population isolation, water depletion and diversion, disease, predation by and competition with non-native fishes, and hybridization with non-native trout such as rainbow trout (Heinz Center 2011, Young 2008; USFWS 2007). Changes in precipitation and temperature due to climate change are also considered chief threats to the species (Heinz Center 2011, Young 2008, Hirsch et al. 2013). Historic and current range for this species does not occur within the Bennet Freeze project area and it is unclear if populations still remain on the Navajo Nation (Heinz Center 2011).

Coyote

The coyote does not receive any legal protection or conservation actions to maintain their populations because of their abundance, distribution, lack of threats, and versatility in their wide range of habitats (Heinz Center 2011). Coyotes are of significant cultural importance to the Navajo people.

Desert Bighorn Sheep

The primary threats to desert bighorn sheep include habitat loss and degradation, competition with other herbivores, parasites and diseases, human disturbance and poaching (Heinz Center 2011, UDWR 2008). Bighorn sheep are listed as a game species hunted on the Navajo Nation, but this is limited to only one permit per year for one Navajo Nation member. This is because certain parts of the species, such as their horns, hold ceremonial value for the Navajo people.

Long-term objectives for desert bighorn sheep include evaluating and exploring herd and range expansion, increase sheep auction tag revenue, shift contract obligations to NNDFW staff, monitor and control predator populations, increase education, and increase hunting permits for Navajo hunters.

Golden Eagle

The golden eagle is of significant cultural value to the Navajo people, and is held as the official bird of the Navajo Nation. The status and trends of golden eagle populations in the U.S. is unclear, but some researchers believe their numbers are declining as pressures that impact the species rise. These pressures include reductions in prey availability, and habitat loss due to issues such as invasive species and increased fire frequency, as well as other anthropogenic disturbances (Good et al. 2004; Kochert and Steenhof 2002). In addition, golden eagle populations are significantly affected on Navajo lands by poaching.

Long-term objectives for the Golden Eagle include managing, conserving and protecting Navajo Nation Golden Eagle populations, as well as addressing the threats and stressors facing Navajo Nation Golden Eagle populations. As part of the 10-year strategic action plan for the golden eagle, NNDFW intends to, but not limited to, develop a long-term eagle study to determine negative impacts on collection and future take permit numbers, educate people on the importance of eagles while providing community outreach meetings on impacts of illegal take of eagles, decrease poaching, increase eagle protection by improving habitat and prey base, and evaluate Raptor Protection Policies.

Gunnison's Prairie Dog

Gunnison's prairie dogs are the smallest of the five species native to the U.S. Gunnison's prairie dog habitat has declined significantly over the past century by about 95%, and nearly half of this habitat is restricted to Tribal lands in the four corners region. They are considered a keystone species, and many animals and vertebrate species diversity is dependent on this prairie dog (Heinz Center 2011, UDWR 2007). The most significant to Gunnison's prairie dogs is the sylvatic plague, but human colonization, habitat fragmentation, and killing as a form of pest management are also common. No particular cultural significance is noted for this animal by the NNDFW.

Mountain Lion

The primary threats to mountain lions include habitat fragmentation and loss due to human encroachment, reduced prey base, and hunting. Mountain lions are considered as a species of least concern because they are so widespread, but their populations are considered to be declining (Heinz Center 2011, Caso et al. 2008). Some people of the Navajo Nation use the fat and hide of mountain lions for ceremonial purposes.

Maintaining stable populations on the Navajo Nation for future generations and traditional purposes is the primary long-term goal for mountain lions intended by the NNDFW. This would be accomplished by conducting a mountain lion population study for the next 10 years, as well as a genetic diversity study. In addition, formal partnerships with Grazing Officials, Allotted land users, and DNR to address animal husbandry issues would be developed.

Mule Deer

Mule deer populations are abundant throughout much of their range due to their ability to use a wide range of habitats, which help them to survive as changes occur in the west. Impacts to their population dynamics may be influenced by habitat loss or change, predation, starvation, disease, competition with livestock and other herbivores, climate change, and interactions between these factors (Heinz Center 2011, Mule Deer Working Group 2004; Sanchez Rojas and Gallina Tessaro 2008). The mule deer is culturally significant to the Navajo people and other tribes, and has ceremonial uses throughout the year, as well as provides economic and recreational benefits as an important game species to the community.

Long-term objectives for mule deer include sustaining healthy deer populations for trophy hunts and subsistence hunters, address competition and predation issues, increase education and outreach to communities and other branches of the Navajo government, decrease poaching, as well as maintaining and enhancing healthy habitat where necessary.

Merriam's Wild Turkey

Merriam's wild turkey may occupy a range of up to 40 miles in Ponderosa pine forests, with some individuals utilizing higher elevations in the summer for breeding and nesting, and wintering in lower elevation Ponderosa pine and piñon-juniper woodlands (Heinz Center 2011, Kennamer (no date), Dickson 1992). Threats to this species includes timber harvesting, unmanaged grazing, and human development Wild turkeys are culturally significant to the Navajo for their parts such as, feather, beard and claws, as well as their role in the history of the Navajo people which involved their movement from one world to another.

Rocky Mountain Elk

The Rocky Mountain elk is the species that resides on the Navajo Nation, and is of four existing subspecies of elk within North America. Elk can utilize a variety of habitats due to their flexible diet, but prefer to spend summer months in high-elevation forests and winter months at mid- to low-elevations (Heinz Center 2011, UDWR 2005; RMEF 1999). Threats to their population dynamics include habitat loss, degradation and fragmentation, poaching and disease. Certain parts of elk have ceremonial uses for the Navajo people, and they are an important game species.

3.2.6 Minerals

The Minerals Department is the center for all minerals and exploration/development projects on the Navajo Nation. The Minerals Department is charged with ensuring the proper management and accountability of Navajo Nation mineral resources and the Department is also responsible for the reclamation of lands that are disturbed by mining activities.

The Navajo Nation's mineral wealth comes from large reserves of oil, gas, uranium and surface coal deposits. The Navajo Minerals Department is under the Division of Natural Resources within the Navajo Nation.

The Navajo Minerals Department is made up of four different departments. These departments are:

- Minerals Audit Program
- Mine Safety
- Surface Mining
- Oil and Gas Inspection and Enforcement

The Navajo Abandoned Mine Lands Reclamation/Uranium Mine Tailing Remediation (AML/UMTRA) Department's mission is to restore and reclaim abandoned mine lands on the Navajo Nation. This mission includes: (1) Administration/Management; (2) Public Relations; (3) Public Facility Projects (PFP); (4) AML Maintenance Surveillance Plan; and (5) Monitoring UMTRA sites. The Navajo AML/UMTRA Program is a department under the Division of Natural Resources within the Navajo Nation.

Navajo AML/UMTRA Department Goals

1. To maintain AML funding through Year 2021.
2. To research other Federal funding programs to determine availability of funds for AML problems.
3. Ensure Long-term Stewardship.
4. Expand and update the GIS Database.
5. Continue research, development and safety of Mine Impacted Lands on the Navajo Nation.
6. Enhance Internal Controls for PFP, continue to improve project administration and strengthen partnerships/project commitment.
7. Maintain adequate monitoring of UMTRA sites, provide adequate review of technical documents, coordinate with Tribal, State and Federal agencies on Navajo UMTRA sites, and address specific technical and project issues.
8. Coordinate and communicate effectively with the Department of Energy (DOE) on Navajo UMTRA sites.
9. Improve public outreach programs and provide adequate information to the public through a series of innovative techniques. Ensure 300,000 plus Navajos and U.S. Citizens know who AML is by the end of 5 years. Be more visible at big events and functions with current PR presentations and items.
10. To have effective management/leadership.
11. Improve financial management, efficient records and property management.
12. Maintain quality customer service and support.

Navajo AML/UMTRA Department Objectives for Long Term Planning

- Ensure the stability and long-term maintenance of AML sites
- Communicate and collaborate to complete PFP
- Collaborate with DOE on UMTRA project sites
- Monitor and ensure long-term stability of UMTRA project sites
- Work closely with DOE to address project issues
- Promote public relation and education
- Establish partners on project efforts
- Maintain AML funds to Year 2021
- Seek additional funding sources for AML related work issues
- Provide quality customer services
- Develop, implement and maintain GIS database
- Maintain effective management and leadership
- Ensure accountability

3.2.7 Air

The Navajo Nation Environmental Protection Agency Air Quality Control Program has been tasked to protect, preserve, and enhance the air resources for current and future generations of Navajo People who live on the Navajo Nation.

The Navajo Nation Air Quality Program is broken up into two departments. The first department is the Air Quality Control Program. The second program is the Operating Permit Program. These two departments work together to ensure that the Navajo people have clean air for years to come. The Navajo Nation EPA is a separate entity that falls under the Executive Branch of the Navajo Nation government.

Air Quality Program Objectives

- To develop air quality regulations under the Navajo Nation Air Pollution Prevention and Control Act, and to implement an air permitting program.
- To maintain and expand particulate and gaseous air quality monitoring network.
- To update and maintain the emission inventory.
- To continue participation in the local and regional air quality related activities.
- To provide training for air quality staff.

Operating Permits Program Responsibilities

- Issuance of Title V permits to large and industrial facilities on the Navajo Nation.
- Compliance and enforcement inspections at Title V permitted facilities.
- Address Title V citizen complaints.
- Establish and maintain an Emission Inventory.
- Study new proposed federal regulations to enhance and amend the Navajo Air Pollution Control and Prevention Act.
- Outreach and education activities.

3.2.8 Agricultural Land Use

3.2.8.1 Farming

Farming has been an important part of the history and culture of the Navajo Nation. Farming in the Navajo Nation is managed by the Navajo Nation Department of Agriculture within the Division of Natural Resources. Irrigation systems for agriculture are provided and maintained by the Department of water Resources through its Technical, Construction, and Operations Branch.

Farming Goals

1. Provide planning, coordination, and management of agricultural programs, policies, regulations, and conservation programs.
2. Revitalize the Navajo rural economy to promote self-sufficiency.

Farming Management Objectives

1. Management objectives pending info from BIA

3.2.8.2 Grazing

Livestock grazing has been an important part of the history, culture, lifestyle, and economy of the Navajo Nation. Rangeland and grazing are managed my Navajo Department of Natural Resources Division of Agriculture and in collaboration with the Bureau of Indian Affairs (BIA). The BIA regulates the grazing of livestock on Indian lands, including all lands within the boundaries of the Navajo Nation. Current grazing regulation system was developed in 1944 and divided the Navajo Nation into 19 Range Management Districts. The Navajo Nation currently has 20 grazing districts that are organized by the agency.

Grazing Goals

1. Foster healthy relationships between the land, people, and livestock through an informed community that works together.
2. Provide guidance and tools for implementing sustainable grazing practices, noxious weed removal, and feral livestock removal in order to improve native plant communities on the range, riparian, and upland areas, to improve stream and floodplain stability and function, and to provide healthy forage for livestock and wildlife.

Grazing Management Objectives

1. Manage and develop resource assets
2. Manage grazing permits and monitor annually for adherence to permit provisions, including permittee compliance with requirements described in conservation plans.

References

Alden, P. et al. *National Aubudon Society field guide to the southwestern states.* Alfred A. Knopf, New York, 1999. Print.

Arizona Department of Agriculture (2005) Prohibited, regulated and restricted noxious weeds, Plant Services Division, Phoenix, AZ.

Arizona Game and Fish Department (AZGFD). (2006). DRAFT Arizona's Comprehensive Wildlife Strategy: 2005-2015. Arizona Game and Fish Department. Phoenix, Arizona.

Arizona Rural Policy Institute, et al. (2010) *Demographic Analysis of the Navajo Nation Using 2010 Census and 2010 American Community Survey (ACS) Estimate*s. Navajo Nation Planning and Development.

Bureau of Indian Affairs (1995) Navajo Nation timberland assessment report for the Defiance Plateau/Chuska Mountains Forest Area. U. S. Department of the Interior. Bureau of Indian Affairs, Central Office, Division of Forestry, Branch of Forest Resources Planning, Portland, OR

Breshears, D. D., N. S. Cobb, P. M. Rich, K.P. Price, C. D. Allen, R. G. Balice, W. H. Romme, W. H. Kastens, J. H. Floyd, M. L. Belnap, and J. J. Anderson. (2005). Regional vegetation die-off in response to global-change-type drought. *Proceedings of the National Academy of Sciences of the United States of America, 102*(42), 15144-15148.

Breshears, D. D., O. B. Myers, C. W. Meyer, F. J. Barnes, C. B. Zou, C. D. Allen, N. G. McDowell, and W. T. Pockman. (2009). Tree die-off in response to global change-type drought: Mortality insights from a decade of plant water potential measurements. *Frontiers in Ecology and the Environment* 7(4): 185-189.

Brown, T.G. *The role of abandoned stream channels as over-wintering habitat for juvenile salmonids.* M.Sc. thesis, University of British Columbia, Dept. of Forestry, Vancouver, B.C., 1985. Print.

Brugge, D, and R. Goble. 2002. The history of uranium mining and the Navajo people. *American Journal of Public Health* 92(9): 1410-1419.

Caso, A., et al. (2008). *Puma concolor*. In: IUCN 2010. IUCN Red List of Threatened Species. Version 2010.4. <www.iucnredlist.org>.

Chenoweth, W.L. 2007. Unpublished review comments for Abandoned Uranium Mines and the Navajo Nation: Navajo Nation AUM screening assessment report and atlas with geospatial data. July 6, 2007.

Connelly, J.W. et al. (2004). Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats. Western Association of Fish and Wildlife Agencies. Unpublished Report. Cheyenne, Wyoming. Accessed at http://sagemap.wr.usgs.gov/FeaturedPubs.aspx/.

Crimmins M, Selover N, Cozzetto K, Chief K (2013) A Meadow (editor) Technical Review of the Navajo Nation Drought Contingency Plan – Drought Monitoring. Report for the Navajo Department of Water Resources, Ft. Defiance, AZ.

Development Needs of the Former Bennett Freeze Area (1994): Hearing before a Subcommittee of the Committee on Appropriations, United States Senate, One Hundred Third Congress, First Session, Special Hearing.

Dickson, J. (1992). The Wild Turkey: Biology and Management. National Wild Turkey Federation. United States Forest Service. Stackpole Books. 463 pages ISBN 081171859X.

Ecosystem Management, Inc. (2015). Vegetation Management Plan for Navajo Abandoned Mine Lands Reclamation Program.

Elmore, Francis H. (1943). Ethnobotany of the Navajo, A monograph of the University of New Mexico and the School of American Research. Monograph Series, Vol. 1, Number 7. Albuquerque, NM, University of New Mexico Press. 136 p.

Federal Emergency Management Agency (FEMA) (2016). FEMA Flood Map Service Center. Web. Accessed September 2016. https://msc.fema.gov/portal.

Garshelis, D.L. et al. (2008). *Ursus americanus*. In: IUCN 2010. IUCN Red List of Threatened Species. Version 2010.4. Accessed at www.iucnredlist.org.

Geisler, M. (2011). Pine nuts profile. Agricultural Marketing Resource Center, Iowa State University. Accessed at http://www.agmrc.org/commodities__products/nuts/pine_nuts_profile.cfm.

Good, R., et al, (2004), Population Level Survey of Golden Eagles (*Aquila chrysaetos*) in the Western United States, prepared for the U.S. Fish and Wildlife Services, August 30, 2004.

Groen, A.H. (2005a). *Yucca glauca*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Accessed at http://www.fs.fed.us/database/feis/.

Groen, A.H. (2005b). *Yucca baccata*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Accessed at http://www.fs.fed.us/database/feis/.

Hahne, F. J. (1990). Early uranium mining in the United States. In *Uranium and nuclear energy: 1989. Bicentenary of the discovery uranium*.

Heinz Center. (2011). Developing a long-term strategic plan for the Navajo Nation Department of Fish and Wildlife: report and workshop summary. The H. John Heinz III Center for Science, Economics and the Environment.

Hirsch, C.L., M.R. Dare, and S.E. Albeke. 2013. Range-wide status of Colorado River cutthroat trout (Oncorhynchus clarkii pleuriticus): 2010. Colorado River Cutthroat Trout Conservation Team Report. Colorado Parks and Wildlife, Fort Collins.

Kelley, Vincent Cooper (1955). *Regional Tectonics of the Colorado Plateau and Relationship to the Origin and Distribution of Uranium: Prepared in cooperation with U.S. Atomic Energy.* University of New Mexico Press

Kelly, M., et al. (2008). *Lynx rufus*. In: IUCN 2010. IUCN Red List of Threatened Species. Version 2010.4. Accessed at www.iucnredlist.org.

Kennamer, M. (undated). Merriam's Wild Turkey (*Meleagris gallopavo marriami*). National Wild Turkey Federation Wildlife Bulletin No. 4.

Knick, S. T., Dobkin, D. S., Rotenberry, J. T., Schroeder, M. A., Haegen, W. M. V., van Riper, C. (2003)Teetering on the edge or too late? Conservation and research issues for avifauna of sagebrush habitats. *The Condor* 105: 611–634

Kochert, M., and Steenhof, K. (2002). Golden Eagles in the U.S. and Canada: Status. Trends and Conservation Challenges. J. Raptor Res. 36 (1 Supplement): 32-40.

Ladyman, J.A.R. (2004). Status Assessment report for *Sclerocactus mesae-verdae* (Mesa Verde cactus). Prepared for the Navajo Natural Heritage Program by Juanita A.R. Ladyman, JnJ Associates, LLC, Centennial, CO. Accessed at www.nndfw.org.

Little, E.L. (1980). The Audubon Society Field Guide to North American Trees: Western Region. New York: Alfred A. Knopf. 640 p.

Lowe, Charles H. *Arizona's Natural Environment: Landscapes and Habitats.* Books on Demand, University of Chicago, 1964. Print.

Lowe CH, Brown DE (1973) The Natural Vegetation of Arizona. Arizona Resources Information System, Phoenix, AZ

McLemore, V. T., and W.L. Chenoweth. 1989. Uranium resources in New Mexico. New Mexico, Bureau of Mines and Mineral Resources, New Mexico Institute of Mining and Technology, Socorro, New Mexico, Resource Map 18. 36 Pp.

Mikesic, D. and D. Roth. 2008. Navajo Nation endangered species list: species accounts. Version 3.08. Navajo Natural Heritage Program, Department of Fish and Wildlife, Window Rock, Arizona.

Melillo, J. M., T. C. Richmond, and G. W. Yohe, Eds. 2014. Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program, 841 pp.

Mule Deer Working Group. (2004). North American Mule Deer Conservation Plan, Western Association of Fish and Wildlife Agencies.

Nania, J., K. Cozzetto, N. Gillet, S. Duren, A. M. Tapp, M. Eitner, and B. Baldwin. 2014. Considerations for Climate Change and Variability Adaptation on the Navajo Nation. University of Colorado, Boulder, CO.

Navajo Grazing Regulations 25 C.F.R. §167 (2015)

Navajo Nation and Hopi Tribe. (2006) Intergovernmental Compact. November 3, 2006. Bureau of Indian Affairs website <http://www.doi.gov/bia/docs/intergovernmental_compact.pdf>

Navajo Nation Council, Resources Committee (NNCRC). (2008). Biological Resource Land Use Clearance Policies and Procedures (RCP). RCS-44-08. Approved September 10, 2008. Accessed at http://www.nndfw.org/.

------ Division of Economic Development. "Chapter III: The Economy." *2009-2010 Comprehensive Economic Development Strategy; The Navajo Nation.* 19-39. Web.

------ Division of Health and Navajo Epidemiology Center. 2013. Navajo Population Profile 2010 U.S. Census. Pg. 35. Window Rock, Arizona, Navajo Nation.

------ Division of Transportation (2015). Navajo Nation Airport System Master Plan, Draft Final Report. Prepared by Armstrong Consultants, Inc., Mesa Arizona 85210. 452pp.

------ Department of Water Resources. *Navajo Nation Drought Contingency Plan.* 2003. Web.

------ (2011) *Draft Water Resource Development Strategy for the Navajo Nation.*Web.

Navajo Nation. *Local Governance Act. Navajo Nation Code: Title 26 Navajo Nation Local Governance Act.* Print.

Navajo Natural Heritage Program (NNHP). (2004). Monitoring Report: Mesa Verde Cactus Transplantation for BIA Route N57, Cudei Rd., San Juan County, NM. Navajo Natural Heritage Program, Window Rock, AZ. Accessed at http://www.nndfw.org/ on May 31, 2011.

Navajo Resource Conservation Development (2002) Navajo Noxious Weed Training Program. Project No. EW98-007, St. Michaels, AZ.

Navajo Times. Navajo Nation Chapter Series. Web. September 2016. http://www.navajotimes.com/news/chapters/archive.php.

Pontius, Dale. (1997) *Colorado River Basin Study: Final Report. Report to the Western Water Policy Review Advisory Commission.* Web

Powell, A. K. (Ed.). (1994). *Utah history encyclopedia*. Salt Lake City, UT: University of Utah Press.

Redsteer, M. H., K. B. Kelley, H. Francis, and D. Block. (2014). Increasing Vulnerability of the Navajo People to Drought and 34 Climate Change in the southwestern United States: Accounts from Tribal Elders, in Special Report on Indigenous People, 35 Marginalized

Populations and Climate Change; D. Nakashima, J. Rubis, and I. Krupnik, eds., Cambridge University Press, 36 p xx–yy.

Rocky Mountain Elk Foundation (RMEF). (1999). Elk Facts, accessed at www.rmef.org.

Sanchez Rojas, G. and Gallina Tessaro, S. (2008). *Odocoileus hemionus*. In: IUCN 2010. IUCN Red List of Threatened Species. Version 2010.4. Accessed at www.iucnredlist.org.

Southwest Exotic Mapping Program (SEMP) (2007) Regional Database, Coconino, Arizona, Navajo Indian Reservation.

Thornbury, William D. (1969) *Principles of Geomorphology.* McGraw-Hill, New York, Print.

U.S. Bureau of the Census. (2010). American Fact Finder, Profile of General Demographic and Housing Characteristics: 2010. Available from http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml. Accessed May 2015.

U.S. Bureau of Reclamation. *North Central Arizona Water Supply Study.* (2006) October. Web. https://www.usbr.gov/lc/phoenix/reports/ncawss/NCAWSSP1NOAPP.pdf.

U.S. Department Agriculture, Animal and Plant Health Inspection Service (2012) Federal noxious weed list, Plant Protection and Quarantine, last updated 9/30/2014.

------ Census of Agriculture (2012). Web. September 2016. https://www.agcensus.usda.gov/Publications/2012/.

------ Natural Resources Conservation Service Soil Survey Staff. 2013. Little Colorado River Area, Arizona, Parts of Coconino and Navajo Counties.

------ Natural Resource Conservation Service (2014) The PLANTS Database (http://plants.usda.gov). National Plant Data Team, Greensboro, NC

U.S. Fish and Wildlife Service (USFWS). (2007). Endangered and Threatened Wildlife and Plants; 12-Month Finding for a Petition To List the Colorado River Cutthroat Trout as Threatened or Endangered. Federal Register. Vol. 72, No. 113. Wednesday, June 13, 2007. proposed rules. pp. 32589-32605.

------ (2016). National Wetlands Inventory. Web. September 2016. https://www.fws.gov/wetlands/data/mapper.html.

Ulev, E. (2007). *Ursus americanus*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Accessed at www.fs.fed.us/database/feis/.

Utah Division of Wildlife Resources (UDWR). (2005). Rocky Mountain Elk (*Cervus elaphus* nelson). Wildlife Notebook Series No. 12.

------ (2007). Utah Gunnison's prairie dog and white-tailed prairie dog conservation plan: Final Draft. Salt Lake City, Utah. Accessed at wildlife.utah.gov/furbearer/pdf/prairie_dog_plan.pdf.

------ (2008). Utah Bighorn Sheep Statewide Management Plan.

West NE (1983) Great Basin-Colorado Plateau sagebrush semi-desert. In, Temperate Deserts and Semi-Deserts, NE West ed. pp 331-349, Elsevier Scientific Publishing Co., The Netherlands.

Whitson TD, ed. (1996) Weeds of the West. The Western Society of Weed Science, 5th Edition.

WHPacific, Inc. 2008a. Former Bennett Freeze Area Recovery Plan. Prepared for the Navajo Nation Division of Community Development.

------ 2008b. Bodaway/Gap Chapter Comprehensive Land Use Plan. Prepared for the Navajo Nation Division of Community Development Design and Engineering Services.

------ 2008c. Cameron Chapter Comprehensive Land Use Plan. Prepared for the Navajo Nation Division of Community Development Design and Engineering Services.

------ 2008d. Coalmine Canyon Chapter Chapter Comprehensive Land Use Plan. Prepared for the Navajo Nation Division of Community Development Design and Engineering Services.

------ 2008e. Coppermine Chapter Comprehensive Land Use Plan. Prepared for the Navajo Nation Division of Community Development Design and Engineering Services.

------ 2008f. Kaibeto Chapter Comprehensive Land Use Plan. Prepared for the Navajo Nation Division of Community Development Design and Engineering Services.

------ 2008g Leupp Chapter Comprehensive Land Use Plan. Prepared for the Navajo Nation Division of Community Development Design and Engineering Services.

------ 2008h. Tolani Lake Chapter Comprehensive Land Use Plan. Prepared for the Navajo Nation Division of Community Development Design and Engineering Services.

------ 2008i. Tonalea Chapter Comprehensive Land Use Plan. Prepared for the Navajo Nation Division of Community Development Design and Engineering Services.

------ 2008j. Tuba City Chapter Comprehensive Land Use Plan. Prepared for the Navajo Nation Division of Community Development Design and Engineering Services.

Wilkins, D.E.E. (2002) Governance within the Navajo Nation: Have Democratic Traditions Taken Hold?" *Wicazo Sa Review*, 17(1): 91-129.*Project MUSE*, doi:10.1353/wic.2002.0010.

Young, M. (2008). Colorado River Cutthroat Trout (*Oncorhynchus clarkii pleuriticus*): A Technical Conservation Assessment, Prepared for the USDA Forest Service, Rocky Mountain Region, Species Conservation Project, General Technical Report RMRS-GTR-207-WWW.

Appendix

Appendix A–Memorandum of Understanding between the Navajo Nation and the Bureau of Indian Affairs, Navajo Regional Office

Appendix B – Ecological Site Descriptions

The ecological site is a product of all the environmental factors responsible for its development including soils, topography, climate and fire (NRCS 2014). An ecological site is recognized and described based on its ability to produce and support a particular plant community. The following ecological sites are present within the FBFA and surrounding areas. The FBFA contains 40 different ecological sites.

Rangelands

Sandy Loam Upland 10–14" (Site ID: R035XA117AZ)

These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys and deep canyons and occurs in an upland position on gently sloping plains or alluvial fans. Elevations range from 4,800–6,300 feet and precipitation averages 10 to 14 inches per year. The potential native plants are Stipa species, Indian ricegrass, galleta, and blue grama, fourwing saltbush, winterfat, and cliffrose. Annual production is between 245–805 lbs/acre. Soils are deep and well-drained and range from sandy loam to fine sandy loam texture (4–10 inches thick). Soils have high permeability but have a very low available water capacity. These sites are compatible with planned livestock grazing systems and provides suitable wildlife habitat and sufficient resources for grazing wildlife.

Sandy Loam Upland 6–10" (Site ID: R035C317AZ)

These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons. Elevation range for these sites 5,000–6,800 feet and precipitation averages 10 to 14 inches per year. The potential for native plants are Wyoming big sagebrush, Utah juniper, Colorado pinyon-cliffrose, Mormon tea, fourwing saltbush, blackbrush, Indian ricegrass, needle and thread, western wheatgrass Galleta, black and blue grama, and sand dropseed. Annual production is between 315–525 lbs/acre. Soils are deep, well drained and textures range from very fine sandy loam to sandy loam. Soils at this site hold moisture within root depth of plant community. These sites are favorable for grazing throughout much of the year (except with restricting snow cover). Cool season mid grasses will be replaced by big sagebrush, rabbit brush, snakeweed and lower value forbs and grasses with continuous grazing during winter and spring seasons. These sites provide food for wildlife that utilize grass as a major component of their diet.

Sandy Loam Upland 6–10" (Site ID: R035XB219AZ)

These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys and deep canyons occurring in an upland position. Elevations range from 3,800–5,800 feet and precipitation averages 6 to 10 inches per year. The potential native plants are shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. Annual production is between 535–700 lbs/acre. Soils are deep and moderately well drained and range from sandy loam to loamy sand (4–10 inches thick). Soils are moderately permeable. These sites are suitable for yearlong livestock grazing and provide some food and cover for some wildlife primarily limited to grassland species.

Sandy Loam Upland 6–10" Warm (Site ID: R035XB235AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs on summits and risers of fan terraces and structural benches of plateaus. Elevation range for these sites range from 3,800–5,800 feet and precipitation averages 6 to 10 inches per year. The potential for native plants are shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. Annual production is between 150–300 lbs/acre. Soils are deep to very deep and range from loamy sand to sandy loam. These sites are suitable for yearlong livestock grazing. Soils on this site are vulnerable to wind erosion, particularly in overgrazed areas, roads, cattle trails, and concentration areas. These sites offer a diversity of vegetation for wildlife.

Clay Loam Upland 10–14" (Site ID: R035XA107AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys and deep canyons and occurs in an upland position on mostly level to slightly sloping plains and rolling hills. Elevations range from 4,800–6,300 feet and precipitation averages 10 to 14 inches per year. The potential native plants are Stipa species, Indian ricegrass, galleta, blue grama, fourwing saltbush, winterfat, and cliffrose. Annual production is between 200–680 lbs/acre. Soils are moderately deep to deep and are well-drained and range from sandy clay loam, clay loam or loam with 0 to 30% coarse fragments. Permeability of soils is very slow to moderately slow. These sites are suitable for yearlong livestock grazing and provides suitable habitat for variety of wildlife species.

Clayey Wash 6–10" (Site ID: R035XB202AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons. Elevations range from 3,800–5,800 feet and precipitation averages 6 to 10 inches per year. The potential for native plants are shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. Annual production is between 450–700 lbs/acre. Soils in these sites are deep and well drained and have textures ranging from clay loam to vertic clays. Permeability of soils in these sites ranges from moderately slow to very slow. These sites are suitable for grazing and can greatly benefit from prescribed grazing systems with schedule rest periods during the cool seasons. This site performs as a transitory site for grassland wildlife due to the proximity of water.

Sandstone Upland 10–14" (Site ID: R035XA115AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs in an upland position on rolling mesa tops and rocky escarpments. Elevations range from 4,800–6,300 feet and precipitation averages 10 to 14 inches per year. The potential native plants are Stipa species, Indian ricegrass, galleta, blue grama, fourwing saltbush, winterfat, and cliffrose. Annual production is 210–485 lbs/acre. Soils are very shallow and shallow to sandstone and fractured shale bedrock with textures that range from loamy sand to fine sandy loam. Soils in these sites have low available moisture capacity and readily disperse heavy rains increasing runoff, erosion, and loss of moisture. Soils have slow to moderate permeability. These sites are suitable for livestock grazing and makes great winter range with protection from the wind.

Sandstone Upland 10–14" (Site ID: R035XA118AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs in an upland position as gently rolling plains and mesas. Elevations range from 4,800–6,300 feet and annual precipitation averages 10 to 14 inches. The potential native plants are Stipa species, Indian ricegrass, galleta, blue grama, fourwing saltbush, winterfat, and cliffrose. Annual production is 245 to 490 lbs/acre. Soils are deep and well-drained with textures ranging from sand to coarse sandy loam. Permeability in these sites is rapid and the soils have very low water capacity. These sites are favorable for livestock grazing throughout the year and provide food for grassland wildlife species.

Shallow Loamy 10-14" (Site ID: R035XA119AZ)
These sites characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occur on structural benches, mesas, and ridges. Elevations range from 4,800–6,300 feet and precipitation averages 10 to 14 inches per year. The potential for native plants are Stipa species, Indian ricegrass, galleta, blue grama, fourwing saltbush, winterfat, and cliffrose. Annual production is 390 to 570 lbs/acre. Soils are very shallow and shallow to limestone, sandstone or basalt bedrock or other plant root restricting layers. Soils textures range from a gravelly light clay loam to stony sandy loam. Soils exhibit slow to moderate permeability in these sites. These sites are suitable for livestock grazing and adapt well to prescribe grazing systems. The vegetation provides suitable cover and food for a variety of wildlife.

Sandy Upland 6-10" (Site ID: R035XB217AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs in an upland position on undulating plains, plateaus, and stabilized dunes. These sites will also occur on fan remnants, treads of abandoned floodplains, and summits of structural benches, which may be eolian-mantled. Elevations range from 3,800–5,800 feet and average precipitation is 6 to 10 inches per year. The potential for native plants are shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. Annual production ranges from 270 to 500 lbs/acre. The soils on these sites are deep, somewhat excessively drained, with no plant root restricting layers. Textures of the soils range from sand to coarse sandy loam. These sites are suitable for yearlong grazing by cattle and are easily traversed by all classes of livestock. Soils on these sites have high wind erosion hazard, particularly on disturbed areas such as roads and livestock concentration areas. These sites offer a fair diversity of vegetation for use by primarily grassland wildlife species.

Sandy Upland 6–10" Warm (Site ID: R035XB206AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs on stabilized dunes and sand sheets in dune fields. Elevations range from 3,800–5,800 feet and average annual precipitation ranges from 6 to 10 inches per year. The potential for native plants are shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. Annual production is 80 to 160 lbs/acre. Soils are moderately deep to very deep with textures ranging from coarse sand to loamy very fine sand.

Sandy Upland 6–10" Sodic (Site ID: R035XB223AZ)

These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs as deep sandy sodic soils on stabilized dunes, undulating plateaus, and fan remnants. Elevations range from 3,800–5,800 feet and average annual precipitation at these sites ranges from 6 to 10 inches. The potential for native plants are shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. Annual production ranges from 250 to 565 lbs/acre. Soils are moderately deep to very deep (>40”). Soils in these sites are slightly to moderately sodic with sodicity increasing with depth. The textures of these soils range from coarse sand to coarse sandy loam. These sites are suitable for yearlong grazing by cattle, sheep, goats, and horses and are easily traversed by all classes of livestock. These sites do well with prescribed grazing systems as soils here have high wind erosion hazard, particularly on overgrazed areas, roads, cattle trails, and concentration areas. These sites have fair vegetative diversity for wildlife but limited available water which may restrict the potential for grassland wildlife species.

Sandy Upland 10–14” (Site ID: R035XC315AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs on nearly level to gently rolling uplands to partially stabilized or stabilized dunes on plateaus, fans, and abandoned stream terraces. Elevations range from 5,000–6,800 feet and annual precipitation ranges from 10 to 14 inches. The potential for native plants are Wyoming big sagebrush, Utah juniper, Colorado pinyon – cliffrose, Mormon tea, fourwing saltbush, blackbrush, Indian ricegrass, needle and thread, western wheatgrass, galleta, black and blue grama, and sand dropseed. Annual production is 275 to 500 lbs/acre. Soils are deep to very deep and textures throughout these sites range from loamy fine sands to coarse sands. These sites are suitable for grazing throughout most of the year with shrubs providing forage during the period when snow covers palatable grasses.

Sandy Upland 10–14” Limy, Gravelly (Site ID: R035XC345AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs on mesa summits. Elevations range from 5,860–5,940 feet and average precipitation is 10 to 14 inches per year. The potential for native plants are galleta, Indian ricegrass, narrowleaf yucca, Mormon tea, and Utah juniper. Soil textures range from sand to loamy sand.

Sandy Slopes 10–14” (Site ID: R035XC37AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs on stabilized dunes with steep slopes. The elevations range from 5,000–5,800 feet with average precipitation from 10 to 14 inches per year. The potential for native plants are Wyoming big sagebrush, Utah juniper, Colorado pinyon – cliffrose, Mormon tea, fourwing saltbush, blackbrush, Indian ricegrass, needle and thread, western wheatgrass, galleta, black and blue grama, and sand dropseed. Annual production is 180 to 360 lbs/acre. Soils in this site are deep to very deep with textures of the soil ranging from fine sand, loamy sand to loamy fine sand. This site has limited suitability for grazing by cattle, horse, and sheep during spring, summer, and fall with a good variety of plants. Livestock grazing is severely restricted and proper grazing distribution is often impossible to attain. This site provides a good deal of habitat diversity because of the variety of food, topography, exposures, and cover for wildlife species.

Loamy Wash 6–10" (Site ID: R035XB209AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs in a bottom position on floodplains and low stream terrace that are subject to flooding following rainfall events. Elevations range from 3,800–5,800 feet and average annual precipitation is 6 to 10 inches. The potential for native plants are shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. Annual production is 600 to 1,800 lbs/acre. These sites are suitable for yearlong grazing by cattle; however, continuous grazing during the winter and spring periods will decrease cool season grasses, which are replaced by warm season, lower forage value grasses and shrubs. These sites offer suitable habitat and forage for grassland wildlife species.

Loamy Upland 10–14" (Site ID: R035XC313AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs in plateaus fan terraces, and valley floors. Elevations range from 5,300–6,800 feet elevation and precipitation averages 10 to 14 inches per year. The potential for native plants are Wyoming big sagebrush, Utah juniper, Colorado pinyon – cliffrose, Mormon tea, fourwing saltbush, blackbrush, Indian ricegrass, needle and thread, western wheatgrass, galleta, black and blue grama, and sand dropseed. Annual production is 400 to 650 lbs/acre. Soils are generally deep to very deep with textures ranging from very fine sandy loam to light sandy clay loam. These sites are suitable for grazing throughout most of the year. When these sites are in excellent condition they provide some food for wildlife, primarily as early green forage. Pinyon and juniper make these sites more desirable to wildlife due to habitat diversity.

Loamy Upland 6–10" (Site ID: R035XB210AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs in an upland position on mesas, fans, structural benches, and plains. Elevations range from 3,800–5,800 feet and precipitation averages 6 to 10 inches per year. The potential for native plants are shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. Annual production is 265 to 520 lbs/acre. Soils are moderately deep to deep to any plant root restricting layers and have textures that range from fine sandy loam to sandy clay loam. These sites are suitable for yearlong grazing by cattle. Erosion is typically not a hazard in these sites unless the vegetational cover has been reduced. These areas are dominated by grassland wildlife species.

Loamy Wash 6–10" Saline-Sodic (Site ID: R035XB211AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs in the drainage or bottom positions on the landscape that have the potential to flood following storm events. Elevations range from 3,800–5,800 feet and precipitation averages 6 to 10 inches per year. The potential for native plants are shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. Annual production is 500 to 800 lbs/acre. Soils are stratified flow deposited soils that are deep and well drained, formed from mixed alluvium. The textures of the soils in these sites ranges from very fine sandy loam to sandy clay loam. These sites produce large amounts of quality forage during all grazing periods and prescribed grazing systems can benefit this site by

allowing rest periods for the cool season species. The plant community provides a variety of food and cover plants for wildlife that utilize grass as a portion of their diet.

Loamy Bottom 6–10" Subirrigated, Saline (Site ID: R035XB212AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs in a bottom position and has a water table within reach of most of the herbaceous vegetation during the main part of the growing season. Elevations range from 4,500–5,500 feet and average precipitation per year is 6 to 10 inches. The potential for native plants are fourwing saltbush, vine mesquite, and alkali sacaton. Annual production is 40 to 60 lbs/acre. The soils that make up these sites are deep and poorly drained with textures that range from clay loam or clay about 8–10 inches thick underlain by a substratum of clay, silty clay, and clay loam.

Loamy Bottom 6–10" Perennial (Site ID: R035XB269AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs on low braided flood plains of the San Juan River. Elevations range from 4,600–5,000 feet with average annual precipitation 6 to 10 inches. The potential for native plants are Fremont cottonwood, coyote willow, rubber rabbitbrush, desert saltgrass, western wheatgrass. Annual production ranges from 15 to 75 lbs/acre. The soils are very deep and formed in alluvium from sandstone, shale, and quartzite. Soil textures include loamy fine sand, fine sandy loam, silt loam, stratified very gravelly coarse sand and sand. These sites are suitable for year-long grazing by all classes of livestock; however, grazing management should be used in these sites. These wetland sites attract maximum numbers of species of upland wildlife.

Sandy Wash 6–10" (Site ID: R035XB216AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs in a bottom position on stream terraces, floodplains, and drainageway channels. Elevations range from 3,800–5,800 feet and precipitation averages 6 to 10 inches per year. The potential for native plants are shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. Annual production is 450 to 900 lbs/acre. The soils on these sites are deep and well drained with textures that are mixed and stratified with thin horizons of loamy textures. These sites are not well suited for unmanaged grazing by various ungulates.

Sandstone Upland 10–14" (Site ID: R035XC333AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons. Elevations range from 5,000–6,800 feet with average precipitation of 10 to 14 inches per year. The potential for native plants are Wyoming big sagebrush, Utah juniper, Colorado pinyon – cliffrose, Mormon tea, fourwing saltbush, blackbrush, Indian ricegrass, needle and thread, western wheatgrass, galleta, black and blue grama, and sand dropseed. Annual production is 55 to 85 lbs/acre. Soils in these sites are shallow and textures range from loamy fine sand to sand and loamy sand. This site is suitable for grazing during any period of the year by cows, sheep, and horses. This site benefits from prescribed grazing allowing rest periods for the cool season species.

Sandstone Upland 6–10" (Site ID: R035XB204AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons. Elevations range from 3,800–5,800 feet and average annual precipitation ranges from 6 to 10 inches per year. The potential for native plants are shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. Annual production is 65 to 155 lbs/acre. Soils are well drained and very shallow and are formed in eolian, residuum, and alluvium derived from sandstone. Soil texture in these sites ranges from fine sand and channery loamy fine sand and exhibit slow to very slow permeability.

Sandstone Upland 6–10" Very Shallow, Warm (Site ID: R035XB230AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs on very shallow soils over weathered sandstone. Elevations range from 3,800–5,800 feet and average precipitation is 6 to 10 inches per year. The potential for native plants are shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. Annual production is 60 to 80 lbs/acre. Soils exhibit moderate to rapid permeability and are very shallow, soils that formed in eolian and alluvial deposits on hills, sand sheets on structural benches and plateaus. These sites are suitable for grazing during any period of the year by cattle, sheep, and horses. The plant community provides a variety of food and cover plants for wildlife. Grazing management that encourage cool season grass species are beneficial to pronghorn.

Sandstone/Shale Upland 6–10" (Site ID: R035XB215AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs in an upland position on plateaus, mesas, or buttes. It is on gently sloping to rolling plains and slopes. Elevations range from 3,800–5,800 feet and precipitation averages 6 to 10 inches per year. The potential for native plants are shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. Annual production is 190 to 360 lbs/acre. Soils are very shallow and shallow to bedrock with surface textures ranging from loamy sand to loam about 1–4 inches thick. These sites are suitable for yearlong grazing by cattle. If these sites become deteriorated they may respond slowly to management. Plant communities on these sites provide a variety of food and cover plants for wildlife.

Sandstone/Shale Upland 6–10" Warm (Site ID: R035XB226AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs on summits and gentle side slopes of plateaus, mesas, and pediments. Elevations range from 3,800–5,800 feet and average annual precipitation ranges from 6 to 10 inches. The potential for native plants are shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. The soils on these sites are formed in residuum and pedisediment from sandstone (calcareous and non-calcareous), mudstone, shale, and conglomerate of the Chinle Formation and Carmel Formation. Most of the soils are very shallow to sandstone.

Colluvial Slopes 6–10" Warm (Site ID: R035XB236AZ)

These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs in an upland position as colluvial sideslopes of hills, escarpments, and cliffs. Elevations range from 3,800–5,800 feet with 6 to 10 inches per year average precipitation. The potential for native plants are shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. Annual production ranges from 44 to 115 lbs/acre. Soils are moderately deep to deep on slopes and may have small pockets of shallow soils. Textures of the soils in these sites ranges from extremely gravelly loam to fine sand to extremely gravelly fine sandy loam. These sites are favorable for sheep grazing (only) throughout most of the year. These sites respond well to grazing management that allows for rest of cool season species. Wildlife is limited due to steepness of topography and vegetative form and lack of water.

Limestone/Sandstone Upland 6–10" (Site ID: R035B232AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs on limestone and calcareous sandstone of the Kaibab formation on benches and slopes of plateaus. Elevations range from 3,800–5,800 feet with an average annual precipitation of 6 to 10 inches. The potential for native plants are shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. Annual production ranges from 150 to 300 lbs/acre. Soils associated with these sites have developed in mixed residuum an alluvium from parent material of limestone and sandstone. Soils are strongly effervescent at or near the surface and are very shallow to shallow, often with small areas of rock outcrop and/or soil of only a few inches in depth. These sites are suitable for grazing during any period of the year by cattle, sheep, and horses and provides a variety of food and cover for wildlife.

Limestone/Sandstone Upland 10–14" (Site ID: R035XC319AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs on gently rolling plateaus and structural benches. Elevations range from 5,000–6,800 feet and precipitation averages 10 to 14 inches per year. The potential for native plants are Wyoming big sagebrush, Utah juniper, Colorado pinyon – cliffrose, Mormon tea, fourwing saltbush, blackbrush, Indian ricegrass, needle and thread, western wheatgrass, galleta, black and blue grama, and sand dropseed. The soils are shallow to bedrock; however, rock outcrop is uncommon. Soil textures are dominantly loam, but can be fine sandy loam or sandy clay loam. These sites are usable yearlong by livestock and responds well to management despite shallow soils. Wildlife is supported when these sites are in excellent condition.

Limestone/Sandstone Cliffs 6–10" (Site ID: R035XB240AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs on all aspects. Elevations range from 3,800–5,800 feet with 6 to 10 inches of precipitation per year. The potential for native plants are shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. Annual production is 25 to 145 lbs/acre. Soils are very shallow or shallow to bedrock (<20"). The soils in these sites formed in alluvium, colluvium, and residuum from limestone, calcareous sandstone, and siltstone of the Kaibab Formation. Accessible areas are

grazed by cattle, horses, sheep, goats, and wild horses. These areas provide sufficient habitat for a variety of bird species and other wildlife species.

Limestone/Sandstone Hills 10–14" (Site ID: R035XC308AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs on steeper hillsides and escarpments that have shallow soils over limestone and sandstone. Elevations range from 5,000–6,500 feet and precipitation averages 10 to 14 inches per year. The potential for native plants are Wyoming big sagebrush, Utah juniper, Colorado pinyon – cliffrose, Mormon tea, fourwing saltbush, blackbrush, Indian ricegrass, needle and thread, western wheatgrass, galleta, black and blue grama, and sand dropseed. Annual production averages 300 to 500 lbs/acre. Wildlife includes mule deer, cottontail rabbit, blacktail jackrabbit, several species of lizards and snakes coyote, and pronghorn.

Mudstone/Sandstone Hills 6–10", Warm (Site ID: R035XB251AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs on hillslopes and breaks within the Moenkopi Formation and on toeslopes through summits of hills. Elevations range from 3,800–5,800 feet and precipitation averages 6 to 10 inches per year. The potential for native plants are shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. Annual productivity ranges from 3 to 10 lbs/acre. The soils in these sites are shallow or very shallow to mudstone or sandstone of the Moenkopi Formation.

Mudstone Slopes 6–10" (Site ID: R035XB283AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occur on mostly bare clay slopes commonly known as badlands in the painted desert. These sites occur on escarpments, hills, and structural benches, backslopes and footslopes of mesas, buttes and hill remnants. Elevations range from 3,800–5,800 feet and precipitation averages 6 to 10 inches per year. The potential for native plants are shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. Annual productivity ranges from 3 to 20 lbs/acre. These sites are very unproductive which require very large acreages to support a livestock operation. These sites are adapted to grassland wildlife species.

Basalt Upland 6–10" (Site ID: R035XB231AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs on summits and slopes of lava flows and footslopes of hills. Elevations range from 3,800–5,800 feet and average annual precipitation is 6 to 10 inches. The potential for native plants are shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. Annual production is 5 to 60 lbs/acre. The soils are shallow to basalt rubble and bedrock formed from residuum alluvium, and residuum from pyroclastic basalt flows.

Sedimentary Cliffs 10-14" (Site ID: R035XC302AZ)
These sites are characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs as steep canyon walls, with small plateaus,

and ledges. These sites experience excessive drainage. Elevations range from 4,800–6,700 feet and precipitation averages 10 to 14 inches per year. The potential for native plants are Wyoming big sagebrush, Utah juniper, Colorado pinyon – cliffrose, Mormon tea, fourwing saltbush, blackbrush, Indian ricegrass, needle and thread, western wheatgrass, galleta, black grama, blue grama, and sand dropseed. Annual production is 200 to 450 lbs/acre. The soils are very shallow to shallow. These sites have complex geologic strata and has created a multitude of soil textures, and developments. These sites are quite steep which severely restricts use by livestock. These sites provide a great deal of habitat diversity because of the topography, exposures, plant community variation, and rockiness.

Forestlands

Pinus edulis-Juniperus osteosperma/Purshia stansburiana-Yucca baccata/Bouteloua curtipendula-Bouteloua gracilis (Site ID: F035XG714AZ)

This site is characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons and occurs on structural benches and mesas. Elevations range from 7,000–7,100 feet with average annual precipitation of 14 to 18 inches per year. The potential for native plants are banana yucca, Bigelow sage, black sagebrush, blue grama, cactus, *Ephedra*, pinyon, cliffrose, Utah agave, Utah juniper, western wheatgrass, Wyoming big sagebrush. Soils are loamy, mixed, superactive, mesic Aridic Lithic Haplustepts.

Pinus edulis-Juniperus osteosperma/Quercus xpauciloba-Purshia stansburiana/Muhlenbergia pungens (Site ID: F035XC374AZ)

This site is characterized by exposures of steep bedrock and cliffs, either barren or with sparse vegetation growing in cracks and crevices or in thin layers of eolian, alluvial, or colluvial material and occurs on structural benches and ledges on escarpments. Elevations range from 4,500–6,500 feet with average precipitation of 10 to 14 inches per year. The potential for native plants are broom snakeweed, Colorado pinyon, Sandhill muhly, Stansbury cliffrose, Utah juniper. Soils are deep and excessively drained.

Information from:
United States Department of Agriculture, Natural Resources Conservation Service. 2012. Soil Survey of Little Colorado River, Arizona, Parts of Coconino and Navajo Counties. Accessible online at http://soils.usda.gov/survey/printed_surveys/

Appendix C – Sensitive Plant Species of the Navajo Nation

Sensitive plant species identified by Navajo Nation Natural Heritage Program (division of Navajo Nation Fish and Wildlife, 2008) that are found within the Navajo Nation.

Common Name	Scientific Name
A Buckwheat	*Eriogonum ripleyi*
Alpine Fever-few	*Parthenium alpinum var. alpinum*
Arboles Milk-vetch	*Astragalus oocalycis*
Arizona Rabbitbrush	*Chrysothamnus molestus*
Atwood's Catseye	*Cryptantha atwoodii*
Bighead Spring-parsley	*Cymopterus megacephalus*
Bolack's Sand Verbena	*Abronia bolackii*
Bolander Quillwort	*Isoetes bolanderi*
Broom Pea	*Psorothamnus scoparius*
Buell Park Phacelia	*Phacelia buell-vivariensis*
Canaan Daisy	*Erigeron canaanii*
Canyon de Chelly Thistle	*Cirsium chellyense*
Cave Evening-Primrose	*Oenothera cavernae*
Chaco Milk-vetch	*Astragalus micromerius*
Chuska Milk-vetch	*Astragalus chuskanus*
Clifford's Groundsel	*Senecio cliffordii*
Clifford's Milk-vetch	*Astragalus cliffordii*
Clipped Wild Buckwheat	*Eriogonum lachnogynum var. colobum*
Clustered Leather-flower	*Clematis hirsutissima var. hirsutissima*
Comb Wash Buckwheat	*Eriogonum clavellatum*
Cottam's Milk-vetch	*Astragalus cottamii*
Creeping Rush-pea	*Caesalpinia repens*
Cutler's Lupine	*Lupinus caudatus var. cutleri*
Cutler's Milkweed	*Asclepias cutleri*
Fairy Slipper	*Calypso bulbosa*
Featherleaf Spring-parsley	*Cymopterus beckii*
Franklin Ceanothus	*Ceanothus greggii var. franklinii*
Gladiator Milk-vetch	*Astragalus xiphoides*
Grand Canyon Evening Daisy	*Hesperodoria scopulorum*
Grand Canyon Rose	*Rosa stellata ssp. abyssa*
Green-stripe Amaranth	*Acanthochiton wrigthii*
Higgins Biscuit root	*Cymopterus acaulis var. higginsii*
Hooded Ladies'tresses	*Spriranthes romanzoffiana*
Howell Phacelia	*Phacelia howelliana*
Intermountain Rubberweed	*Hymenoxys helenioides*
Jame's Rubberweed	*Hymenoxys jamesii*
Kaibab Suncup	*Camissonia specuicola ssp. specuicola*
Knowlton's Hop hornbeam	*Ostrya knowltonii*
La Jolla Prairie Clover	*Dalea scariosa*

Common Name	Scientific Name
Mancos Saltplant	*Proatriplex pleiantha*
Marble Canyon Spurge	*Euphorbia aaron-rossii*
Monument Valley Milk-vetch	*Astragalus monumentalis var. monumentalis*
Narrowleaf Blue Star	*Amsonia tomentosa var. stenophylla*
Navajo Mountain Phlox	*Phlox cluteana*
Painted Desert Milk-vetch	*Astragalus sophoroides*
Patch Phacelia	*Phacelia splendens*
Peebles Navajo Cactus	*Pediocactus peeblesianus var. peeblesianus*
Pigmy Sagebrush	*Artemisia pygmaea*
San Juan False Carrot	*Aletes macdougalii ssp. breviradiatus*
San Juan Gilia	*Aliciella haydenii*
Sand Lily	*Eremocrinum albomarginatum*
Sleeping Ute Milk-vetch	*Astragalus tortipes*
Slender Bog-orchid	*Platanthera stricta*
Snowball Cactus	*Pediocactus simpsonii var. minor*
Spotted Fritillary	*Frittilaria atropurpurea*
Thoreau woollybase Hymenoxys	*Hymenoxys argentea var. thoreauensis*
Thorn Milkwort	*Polygala acanthoclada*
Welsh's Phacelia	*Phacelia welshii*
Western Scurf Pea	*Psoralidium junceum*
Whiting Indigo Bush	*Psorothamnus thompsoniae var. whitingii*
Wright Fishhook Cactus	*Mammillaria wrightii var. wrightii*
Yellow Rabbitbrush	*Chrysothamnus viscidiflorus ssp. planifolius*
Zuni Milk-vetch	*Astragalus missouriens var. accumbens*